RADIO · TELEVISION · ELECTRONIC

SERVICE

VOL. 23

THE TECHNICAL JOURNAL OF THE TELEVISION-RADIO TRADE

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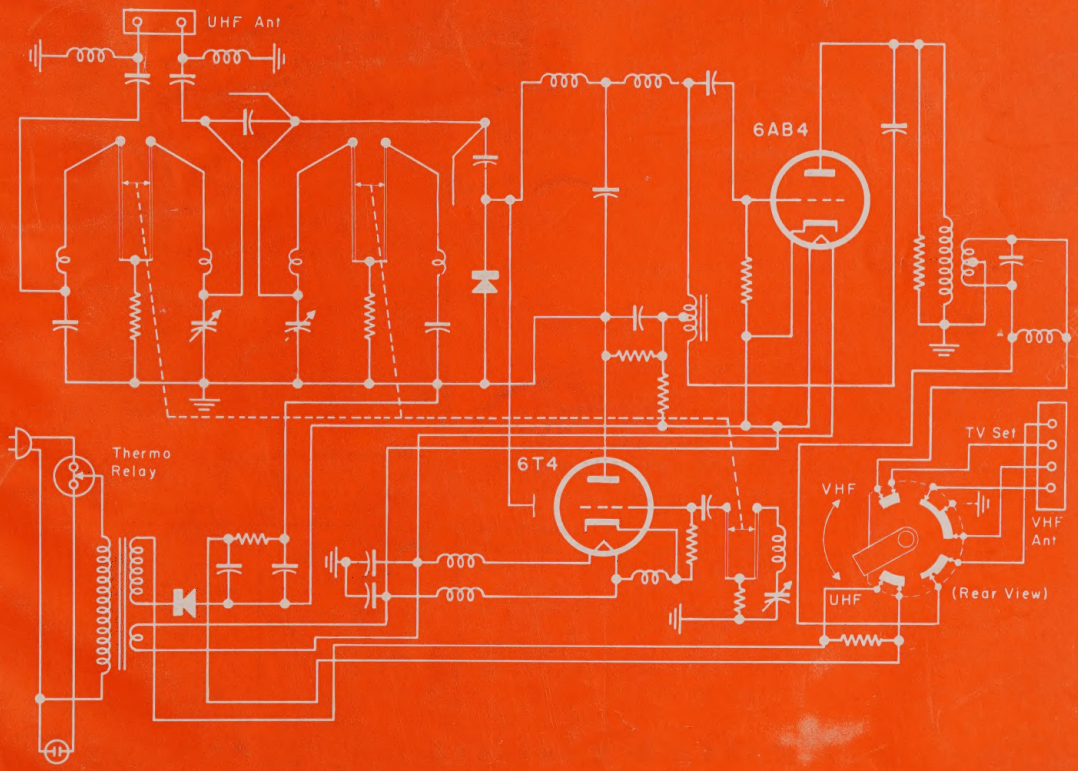
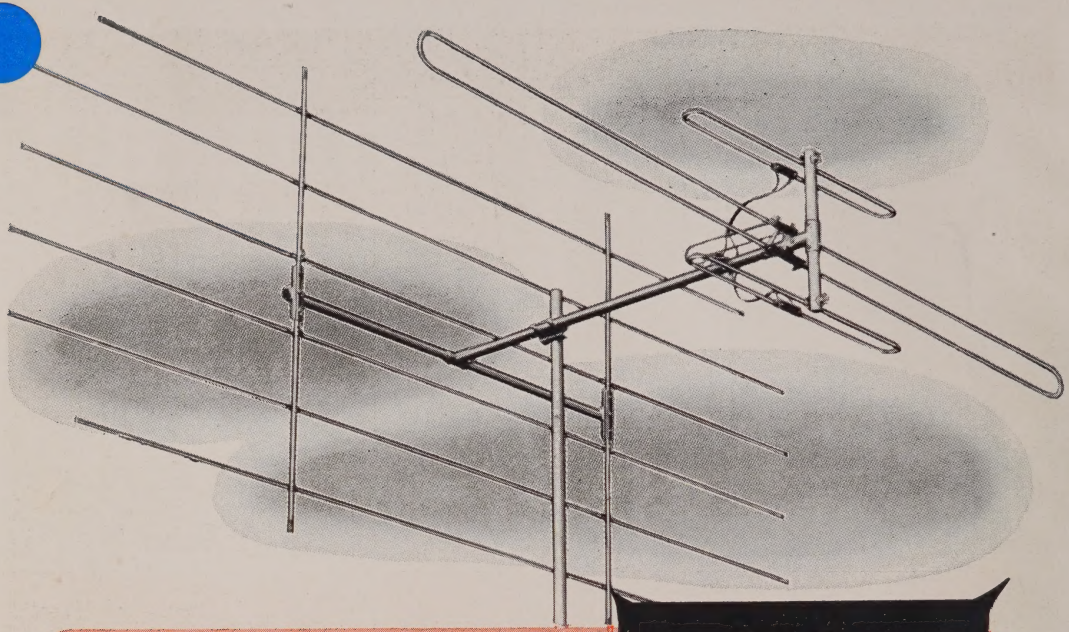
DECEMBER
1954



UHF converter with neutralized grounded-cathode if amplifier. [See circuit analysis, this issue]

D V DAWSON
1010 S ANDERSON
ELWOOD, IND
2DD SR 2-11-54
2-56



RADIART ULTAMATIC

All-Channel TV Antenna

for the FIRST time ...the FIRST Antenna with which You Can *See the Difference*

perfectly synchronized for monochromatic and color TV

THESE QUALITIES HAVE BEEN COMBINED INTO THIS SINGLE ANTENNA — THE ULTAMATIC ...

★ **LOW VOLTAGE STANDING WAVE RATIO** ... the mis-match between antenna and transmission line is lower than four competitive types tested, an attribute to its broad band quality.

★ **FRONT-TO-BACK RATIO** ... higher than multi-element, yagi-type antennas, minimizing co-channel interference.

★ **GAIN** ... expressed in decibels, is a ratio of signal voltage developed by an antenna over that of reference folded dipoles. It is not a quality sold by the pound or achieved by the addition of meaningless elements. The curves shown accurately describe the gain of the Ultamatic. Loss of sound or picture due to erratic antenna response is eliminated.

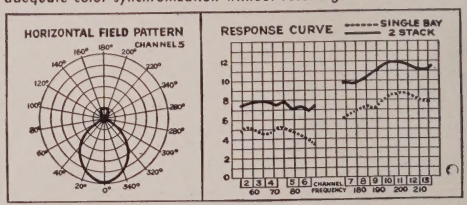
MECHANICAL FEATURES

★ Aluminum screen reflector of exclusive fold-out design, assembled in seconds with adequate stability for years of trouble-free service. Longer elements insure maximum front-to-back ratio on channels 2-6 and are more closely spaced for increased performance on channels 7-13.

★ Dipole and boom assembly are of heavy gauge, seamless tubing. Dipoles fold out and are rigidly supported and reinforced to minimize sag and sway.

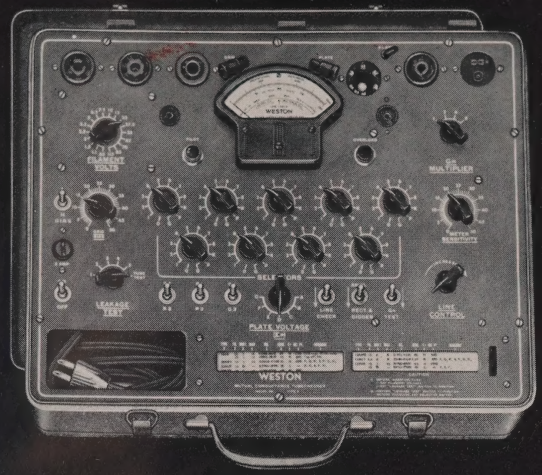
★ Specifically designed mechanically by stress analysis of each unit and sub-assembly to provide a low vibrational period of all elements — your assurance of trouble-free installations.

Most Uniform Gain Response *The gain response DOES NOT VARY MORE THAN 3 D. B. ON ANY CHANNEL across the band. This quality is exceedingly important in color reception to insure adequate color synchronization without resetting.*



THE **RADIART** CORPORATION
CLEVELAND 13, OHIO

TV ANTENNAS ★ AUTO AERIALS ★ VIBRATORS ★ ROTORS ★ POWER SUPPLIES



Weston Model 981
Proportional Mutual Conductance Tubechecker

FILTERED D-C POTENTIALS

for accurate G_m measurements

OUTSTANDING FEATURES:

G_m MEASUREMENTS—G_m measurements are made more accurately by using filtered d-c plate, screen grid and control grid potentials. A precision voltage divider network and selector switch allows a proportionate value of signal voltage to be chosen *for testing tubes having transconductances up to 30,000 micromhos.* Signal voltages of 5.2, 2.6, 1.3, and 0.65 volts peak-to-peak having a frequency of 5000 cycles are provided.

GRID BIAS, SCREEN GRID AND PLATE VOLTAGE: Filtered d-c potentials of 90, 130, and 220 volts are available for plate and screen potentials. A variable filtered d-c voltage in two ranges of 0-5 and 0-20 volts are used to obtain better resolution of Grid Bias settings. *Far greater accuracy is obtainable with filtered d-c potentials than previously possible in portable tubecheckers.*

METER MEASUREMENT OF HIGH LEAKAGE RESISTANCE—Since tube leakage as high as several megohms can cause poor performance in TV Receivers, this tubechecker is designed to provide an accurate meter measurement of leakage resistance as high as 5 megohms between tube elements, thus being particularly useful for TV servicing and TV line production assembly.

TWIN SECTION TUBES—Three toggle switches make it possible to rapidly check and compare the respective sections of twin section tubes at only one setting of the selector switches.

WESTON *980 LINE TEST EQUIPMENT*

THE

980

LINE

PROPORTIONAL
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TUBECHECKER

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Please send literature on the new 981 Tubechecker.

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ADDRESS_____

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SE

NEW *Reproducer*

sounds like $200 – COSTS LESS THAN $60†

Now you can enjoy high fidelity without high prices

What Is It? A new Argos sound enclosure—handsomely styled—built with "Craftsmanship in Cabinets"—plus a Jensen speaker and tweeter.

How Does It Work? It uses the Jensen Duette* principle—which in effect gets double the use out of the internal air mass. It gives big-speaker fidelity in half the space.

How Can I Hear It for Myself? Ask your Argos—or Jensen—Parts Distributor. Your ears cannot be deceived. It *does* sound like $200.

†Argos AD-1 Cabinet..... $21.50

Jensen KDU-10 speaker and tweeter components kit.....

Total.....Under $60.00

Prices may vary West and South.

*TM of and Licensed by Jensen Mfg. Co.

Also see new matching cabinets for Record Player and Tuner or Amplifier.

Argos PRODUCTS COMPANY 310 MAIN STREET • GENOA, ILLINOIS *Craftsmanship in Cabinets*

Vol. 23, No. 12

RADIO · TELEVISION · ELECTRONIC

SERVICE

December, 1954

LEWIS WINNER
Editor

B. BLOCK
F. WALEN
Assistant Editors

Including SERVICE—*A Monthly Digest of Radio and Allied Maintenance;* RADIO MERCHANDISING and TELEVISION MERCHANDISING. Registered U. S. Patent Office.

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ABC AUDITED PAID CIRCULATION

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UHF 3D VHF

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New Low Price!

7.95

FORMERLY 9.95

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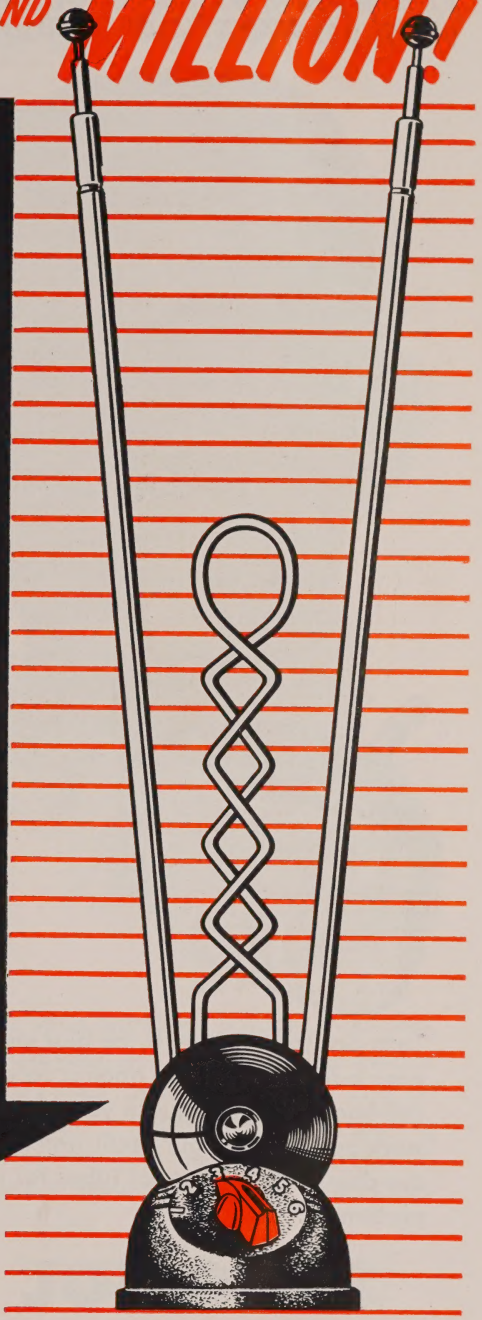

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Tung-Sol Tube quality is the best insurance a dealer can have against service call-backs. You safeguard your service work and protect your profit when you use dependable Tung-Sol Tubes for replacement.

TUNG-SOL®
dependable
PICTURE TUBES

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TUNG-SOL ELECTRIC INC., Newark 4, N. J.
Sales Offices: Atlanta, Chicago, Columbus, Culver City (Los Angeles), Dallas, Denver, Detroit, Newark, Seattle.

Catalogs and Bulletins

J. W. Miller Co., 5917 S. Main St., Los Angeles 3, Calif., has published a 20-page *TV Technician's Coil Replacement Guide* (*155*) with a cross reference for set manufacturer's original equipment with Miller replacement number. Items covered include picture and sound *if* transformers, horizontal oscillator and sync control coils, discriminator-ratio detector coils, and adjustable linearity and width coils.

* * *

Raytheon Manufacturing Co., Receiving Tube Division, Newton 58, Mass., has released an *Industrial Tube Characteristics* booklet containing descriptions of over 450 industrial types, comprising 17 tube classes ranging from subminiatures and miniatures to transistors. Features 20 pages of technical data and basing information, as well as a section covering germanium diodes and pencil tubes.

* * *

Karlson Associates, Inc., 1483 Coney Island Ave., Brooklyn 30, N. Y., has issued a 32-page booklet (*P-39*), describing ultra-fidelity enclosures. Booklet describes what speaker baffles should be used, enclosure designs and applications, and recommended loudspeakers.

* * *

RCA Engineering Products Division, Camden, N. J., has prepared 4-page folder, *How to Read a Blueprint at 500 Feet* (*form 3R2436*), detailing uses of closed circuit TV in plants, and between widely separated buildings. Several applications are outlined.

* * *

Radio Merchandise Sales, Inc., 2016 Bronxdale Ave., New York 62, N. Y., has released an 8-page catalog, describing a line of indoor antennas.

* * *

Heath Co., Benton Harbor, Mich., has published a 48-page kit catalog. Catalog, covering 55 pieces of equipment, features seven new kits, four redesigned models, and details specs on instruments, amateur and hi-fi audio equipment, with schematics for the full line.

* * *

International Resistance Co., 401 N. Broad St., Philadelphia 8, Pa., has issued an 8-page bulletin (*SR-1A*), describing *Mičrostak* selenium rectifiers and selenium diodes, with details on construction, applications, types, ratings, reference curves, *dc* characteristics, etc.

* * *

Stancil-Hoffman Corp., 921 N. Highland Ave., Los Angeles 38, Calif., has released a pamphlet, covering the basic design considerations of magnetic recording heads. Data are supplemented by operational curves. Priced at $.10.

* * *

Minnesota Mining and Manufacturing Co., 900 Fauquier St., St. Paul 6, Minn., has prepared a 3-page bulletin (*30*), discussing the characteristics and applications of *Scotch* brand magnetic tape. Covers physical and magnetic specifications, and shows comparative frequency response curves and layer-to-layer signal transfer.

* * *

Precision Equipment Co., 3682 Milwaukee Ave., Chicago 41, Ill., has published a 24-page catalog, describing shelving installation and lockers, ladders, hand trucks, and parts storage cabinets.

On Book Row

BASIC TELEVISION PRINCIPLES AND SERVICING . . . By BERNARD GROB: Second edition, with a comprehensive analysis of b-w and color TV. Author provides practical explanations of TV principles, receiver circuits, and trouble-shooting procedures. Basic material is presented first, followed by detailed explanations of circuits. Advanced design techniques included in *vhf* and *uhf* receivers are reviewed. Also analyzed are video amplifier and deflection circuits, *agc*, sync, tuners, antennas and transmission lines, FM sound signals, and receiver servicing. Chapters on receiver circuits are concluded with troubleshooting discussions, in which localization of troubles is highlighted.—*660 pages, 6½" x 9", priced at $6.00; McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 36, N. Y.*

* * *

PICTURE BOOK OF TV TROUBLES . . . By RIDER STAFF: A detailed report covering results obtained during troubleshooting of a number of TV receivers in the lab. No attempt is made to explain circuit operation or to offer theoretical explanation of the results. Representative schematics with important normal waveforms at key points in circuit are offered. This is supplemented by abnormal picture tube patterns and waveforms; these are shown and described so that effects of particular faults can be seen and resultant waveforms can be compared with their normal counterparts. Covered are pulse-width *afc*-oscillator, phase detector-stabilized multivibrator *afc*-oscillator, phase discriminator-sine wave oscillator *afc*, and phase detector-sine wave oscillator *afc* circuits.—*80 pages, 5½" x 8½", paper bound, priced at $1.35; John F. Rider, Publisher, Inc., 480 Canal St., New York 13, N. Y.*

* * *

1955 TV DOCTOR . . . By HARRY G. CISIN: A practical book, describing how to recognize and remedy TV troubles, how to recognize and replace defective tubes, how to combat ghosts, interference and snow, and how to read schematic diagrams. Also contains information on TV trouble location, trouble checks, color TV, antenna know-how, *uhf* TV, and practical hints.—*37 pages, 8½" x 11", paper bound, priced at $1.00; H. G. Cisin, Publisher, Amagansett, N. Y.*

* * *

AUTO RADIO SERVICE MANUAL: Fourth of auto-radio service manual series. Covers receivers produced for '53 and '54 cars. Coverage includes data on 50 chassis types used in 62 radio models. Data on each chassis includes schematics, operating voltages, resistances, parts lists with replacement information, and alignment instructions. Includes a cumulative index to all the auto radio manuals previously published.—*288 pages, 8½" x 11", paper bound; Howard W. Sams and Co., Inc., 2201 E. 46th St., Indianapolis 5, Ind.*

* * *

1000 ELECTRONIC QUESTIONS AND ANSWERS . . . By R. J. FREDERICKS: A 12-chapter *q* and *a* manual covering *ac, dc*, AM and FM receivers, TV receivers, transmitters, antennas, hi-fi, test equipment and methods of measurement. Manual offers practical, non-mathematical questions and puzzles which can be answered by use of multiple choice and short answers.—*70 pages, priced at $1.00; Radio Sound Publications Co., Box 38, Utopia Station, Flushing 66, N. Y.*

IT'S FUN TO STAY UP WHEN YOU HAVE SUCH GOOD, CLEAR RECEPTION

The Tung-Sol Tubes you get from your wholesaler are the same high quality tubes used by leading radio and TV set manufacturers. You'll be giving customers like me the best possible service when you replace with Tung-Sol Tubes.

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dependable
TUBES—DIAL LAMPS

TUNG-SOL makes All-Glass Sealed Beam Lamps, Miniature Lamps, Signal Flashers, Picture Tubes, Radio, TV and Special Purpose Electron Tubes and Semiconductor Products.

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Color's bigger than ever! AND THE NEW 2ND EDITION OF

IS MORE THAN EVER A MUST

Color television receivers at much better prices are due to hit dealers' floors any time now. And when color television starts moving in volume . . . every technician must be ready for this new, different, profitable field. There's not a day to lose. Get *your* copy of the brand new 2nd edition of *PRACTICAL COLOR TELEVISION* . . . and get it right away!

Here is the latest *practical* color service information you can get from any source. Included in its 86 pages are: Principles of Color Television . . . Detailed Circuit Diagrams . . . Operating Instructions . . . Antenna Requirements . . . Test Recommendations . . . and much, much more. Time-tested information . . . brought up to the minute by RCA, pioneer in compatible color television.

$2.00 a copy . . . and *worth far more* in future color television profits for you! See your RCA Parts and Tube Distributor, or mail the coupon . . . today.

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CAMDEN, NEW JERSEY

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Camden, N. J.

Please send me _____ copies of *"Practical Color Television"* at $2.00 each.
☐ Check or ☐ Money Order for $____ enclosed.

NAME _____
COMPANY _____
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CITY _____ ZONE _____ STATE _____

Associations

RTSDA, Spokane

MINIMUM PRICE CHARTS for TV service recently prepared by the Radio Television Service Dealers Association of Spokane, Washington, and distributed to all members, have served to spur public interest in the association, eliminate charge confusion and promote business.

The listing covers such items as the replacement of beam benders; picture tube replacement in the home and shop; tuner repair or replacement; video-sound *if*, and horizontal alignment, and assorted circuit repairs and component replacements.

Commenting on the prices detailed in the chart, the association said: "We don't believe anyone can charge less than these prices and yet give the customer the service and protection he is entitled to."

ATSCO, Cincinnati

THE Association of Television Service Companies, Cincinnati, Ohio, reported recently in their monthly bulletin that St. Louis newspapers are now refusing any TV service ads which contain prices. The practice, ATSCO said, was initiated in Cincinnati over a year ago.

SPRTTA, York, Pa.

MEMBERS OF the Southern Pennsylvania Radio-Television Technicians Association toured the telecasting facilities of WGAL-TV recently. Station's chief engineer escorted group through building.

Poster, urging passage of a TV licensing bill, distributed by the Associated Radio Television Servicemen of New York, for car, truck, window and counter display. Copies of the sign were also sent to the Mayor and members of the City Council.

THE MAYOR IS RIGHT!
WHEN HE CLAIMS THAT TELEVISION SERVICING IN OUR CITY IS A $39,000,000 INDUSTRY. FOR YOUR PROTECTION WRITE THE MAYOR AT CITY HALL URGING HIM TO PASS TELEVISION LICENSE BILL NUMBER FIVE (5).

Plan Now for the 4 biggest days in radio-electronics!

I R E National Convention and RADIO ENGINEERING SHOW

March 21-24
New York City

Once again, you'll soon have the opportunity of appraising all of the important new developments of the past year in radio and electronics. In 4 days, from March 21 through 24, the I R E National Convention and Radio Engineering Show will give you the complete picture of significant developments in the industry achieved during the past year.

You'll hear the presentation of scientific and engineering papers of vital interest to you, carefully arranged into related groups of technical sessions.

You'll see more than 700 exhibits in a 4-acre panorama of all that's new in the radio and electronics field, at Kingsbridge Armory and at Kingsbridge Palace.

The Institute of Radio Engineers
1 East 79th Street, New York City

Now EVERYBODY CAN HAVE A "QUICK-HOT" ELECTRONIC SOLDERING GUN

120 V. A.C.
60 CYCLE
1.1 AMP. MAX.

WORKING HOT IN 2½ SECONDS

THE NEW WEN MODEL #199

Costs Only $7.95 RETAIL

and it's ideal for the work you do

It's smaller, lighter—slips readily into tool kit or pocket. Gives *AMPLE* heat—*fast*. Cools quickly too. Has wonderful balance. WEIGHS ONLY 1½ LBS. Easier to use accurately—less tiring. Its extra long narrow tips (replaceable) make it easy to reach tight spots. And they are new type steel nose *LIFETIME* TIPS—practically indestructible in ordinary use. Built-in spotlight automatically illuminates work. Cherry red plastic handle and case are heat and shock resistant. Gun is well made throughout —fully guaranteed. And that price!

FOR HEAVY DUTY THERE'S THE FAMOUS WEN 250 WATT "QUICK-HOT"

567 HOURS
CONTINUOUS OPERATION

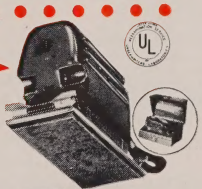
Ideal for many production jobs, maintenance, repairs, intermittent soldering. Delivers more heat so can solder heavier metals. With special tip cuts plastic tile. Fully guaranteed.

RETAILS $12.95

OTHER POCKET PORTABLES YOU'LL WANT TO OWN

SUPER-POWER SANDER
MODEL #303
Light (2½ lbs.)—compact, handy. 120 V. A.C. 60 cycle, 14,400 strokes P.M., straight line action. Kit is Sander, 12 Sandpapers, 2 Polishing Cloths.

SANDER-POLISHER
MODEL #202
For fine finishing. 120 V. A.C. 60 cycle straight line action; no scratches, reaches corners. Also polishes car, etc., only $13.95

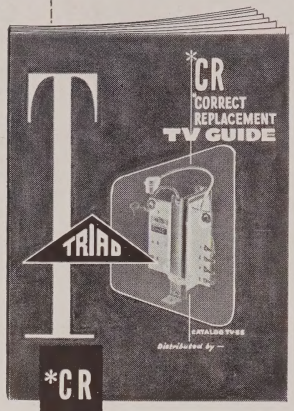


RETAILS $16.95
COMPLETE KIT

WEN PRODUCTS, INC.
5808 NORTHWEST HIGHWAY
CHICAGO 31, ILL.

(Export sales, Scheel International, Inc., Chicago)

IT'S NEW!
IT'S COMPLETE!
IT'S AVAILABLE!



TRIAD'S *CORRECT REPLACEMENT TV GUIDE TV-55

Triad's new TV Guide is available now. It is a complete up-to-date catalog of Triad's *Correct Replacement TV Transformers, exhaustively checked for accuracy. Your jobber has copies of TV-55 in stock... or write us direct.

*Correct Replacement (*CR) transformers are mechanically correct and electrically correct ruggedized versions of original manufacturers' items built to give a longer more satisfactory life.

Triad *CR Transformers are listed in Sam's Photofact folders & Counter Facts and Riders Replacement Parts List.

TRIAD TRANSFORMER CORP.
4055 Redwood Ave., Venice, Calif.

Associations

(Continued from page 6)

RTSA, Pittsburgh

THE RADIO TELEVISION SERVICEMEN'S ASSOCIATION of Pittsburgh, Pa., has begun to set up courses in advanced TV training, following pattern outlined in the RETMA manuals. The Pittsburgh Board of Education is cooperating with the association in organizing the program and providing school facilities.

The recent 18-page issue of the association's monthly, edited by *Bert Bregenzer,* featured a number of excellent articles on business practices, technical hints, industry activities, and news from other state associations.

FRSAP

THE URGENT NEED for a drive to develop strong local associations, affiliated with regional or state groups, was stressed by Charles Knoell, Jr., prexy of TSDA, Philadelphia, in the lead editorial of a newsletter prepared by the Federation of Radio Servicemen's Association of Pennsylvania.

The association headman declared that only well-organized groups, who subscribe to a strict code, can invite solid confidence and insure sound recognition from not only the consumer, but those in the distribution and manufacturing segments of industry.

According to the newsletter, the Chambersburg Service Dealers' Association has applied for a state charter.

MEMBERS of the Associated Radio Servicemen of Central Pa., have enrolled in an advanced TV course as suggested by RETMA. Equipment and chassis and benches have been set up at the Williamsport Trade School.

TEN YEARS AGO

A CONCRETE program of pre-planning to prepare the radio service business for competitive postwar situations, was outlined by *Leonard C. Truesdell,* general sales manager of the Bendix home radio division, before the Philadelphia Radio Servicemens' Association: Service Men should start immediately to acquire additional know-how, modern facilities, equipment and personnel which will be needed to keep pace with newest developments in the field; they should sell the service industry's technical knowledge, services and facilities with soundly conceived advertising, conveniently located places of business and orderly, attractive surroundings; and establish and maintain an efficient system of cost controls and operating budgets so as to be able to provide high quality service on a profit basis. . . . Postwar trends in service equipment were discussed by *Raymond Soward,* chief engineer of Supreme Instruments Corp.

Save TV Alignment Time with the EAZY to use Align-o-Pak
TV alignment Bias Battery Eliminator

★ Quickly determines AGC troubles

Think of the time wasted connecting batteries in series - - - The Align-O-Pak provides all the voltages recommended by these leading TV manufacturers:
• ADMIRAL 1½-4½v
• MOTOROLA 3v • PHILCO 7½v
• RCA 1v • ZENITH 2v Variable.

★ Forget messy Bias Batteries
★ Fix only TWO AGC troubles and your Align-O-Pak is paid for
★ Just Plug it in - - -
★ Provides from 0 to 10 Volts BIAS Instantly
★ Completely isolated from Power Line and Case

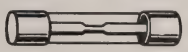
Only $7.85 DEALER NET

INSTRUCTIONS
FOR ALIGNMENT: Plug Align-O-Pak in and turn unit on. Connect black lead to the Receiver AGC buss and red lead to B minus (usually chassis). Set Align-O-Pak knob to voltage recommended by TV manufacturer.
FOR AGC TROUBLE SHOOTING: With Align-O-Pak connected as described above, turn control knob slowly from 0 to 10. If normal picture appears, AGC is defective.

Carried by leading jobbers!

SI SERVICE INSTRUMENTS COMPANY
422 South Dearborn Street, Chicago 5, Illinois

Why it's Good Business to Standardize on BUSS FUSES



Manufacturers and service organizations in increasing numbers are standardizing on BUSS fuses because . . . they know, from their own experience, that BUSS fuses give dependable electrical protection under all service conditions.

In fuses, unfailing dependability is so necessary — for the fuse alone protects when there is trouble on the circuit. And just as important, a fuse should never give a "false alarm" by blowing needlessly.

To make sure that BUSS fuses maintain their 40 year old reputation for highest quality, every BUSS fuse normally used by the Electronic Industries is tested in a sensitive electronic device that automatically rejects any fuse not correctly calibrated, properly constructed and right in all physical dimensions.

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These RAYTHEON SERIES STRING TUBES HAVE 300% GREATER RELIABILITY

High voltage surges due to inequalities of heater warmup time previously have limited the most effective use of "series connections" of tube heaters in TV receivers. The new Raytheon "Series String" Tubes — now used by many leading set manufacturers — virtually eliminate heater burnouts, permitting the use of this type of circuitry which results in lighter, more compact receivers.

Raytheon helped set manufacturers solve this warmup problem, by designing a new line of "Series String" Tubes which feature tightened controls on heater warmup, identical current value and a heater stability so improved that heater burnouts from warmup surges are rare. By narrowing the tolerances on heater wire to one-third of the former specifications and improving heater coating techniques this has been achieved. This important advance plus Raytheon's thorough knowledge of *every* aspect of tube construction guarantees the superior quality of Raytheon "Series String" Tubes.

RAYTHEON 3AL5 is a heater-cathode type double diode of miniature construction. Its principal application is as a diode detector, automatic volume control rectifier, or as a low current power rectifier.	**RAYTHEON 3AU6** is a heater-cathode type, sharp cutoff pentode of miniature construction designed for service as a high-frequency amplifier in radio and television receivers.	**RAYTHEON 3BC5** is a heater-cathode type, sharp cutoff pentode, of miniature construction. Used as an RF amplifier and as a high-frequency, intermediate amplifier.	**RAYTHEON 3BN6** is a 7-pin miniature, heater-cathode type, sharp cutoff pentode. Designed to perform the combined functions of limiting and frequency discrimination in FM and TV receivers.	**RAYTHEON 3CB6** is a heater-cathode type sharp cutoff pentode of miniature construction designed for use as an intermediate frequency amplifier, operating at frequencies in the order of 40 megacycles, or as an RF amplifier in VHF Television Tuners.
RAYTHEON 5AM8 is a diode pentode of miniature construction designed for use as a video detector and IF amplifier in television receivers.	**RAYTHEON 5AN8** is a medium-mu triode and a sharp cutoff pentode of miniature construction designed to perform combined functions of a video detector or IF amplifier and sync separator.	**RAYTHEON 5J6** is a heater-cathode type, double triode of miniature construction designed for mixer applications.	**RAYTHEON 5U8** is a heater-cathode type triode-pentode of miniature construction designed for use as an oscillator mixer.	**RAYTHEON 6S4A** is a heater-cathode type medium-mu, high-perveance triode of miniature construction for use as a vertical deflection amplifier in TV receivers.
RAYTHEON 6SN7GTB is a dual triode designed for use as a combined vertical oscillator and vertical deflection amplifier in television receivers.	**RAYTHEON 7AU7** is a heater-cathode type double triode of miniature construction designed for use as a resistance coupled voltage amplifier, phase inverter, horizontal deflection oscillator or vertical deflection oscillator-amplifier in television receivers.	**RAYTHEON 12AX4GTA** is a heater-cathode type diode designed for use in Horizontal frequency damper service in television receivers.	**RAYTHEON 12BH7A** is a heater-cathode type medium-mu double triode of miniature construction designed for use as a vertical deflection amplifier in television receivers employing "Series String" heater designs.	**RAYTHEON 12BK5** is a miniature beam power pentode designed for use as a power output tube in radio and TV receivers.
RAYTHEON 12BY7A is a heater-cathode type pentode of miniature construction designed for use as a video amplifier.	**RAYTHEON 12L6GT** is a heater-cathode type beam pentode power amplifier. Generally used as an output tube in ac-dc receivers.	**RAYTHEON 12W6GT** is a heater-cathode type beam pentode designed for service as a vertical deflection amplifier in TV receivers having a relatively low B supply voltage.	**Ask your Raytheon Tube Distributor about these and other new Raytheon "Series String" Tubes.**	

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SERVICE

A Look At The Record

At This, the year end, we have our annual opportunity to haul out the books, take a critical inventory of ourselves and see just what did happen to those gilded resolutions, so proudly pronounced, twelve months ago.

It is gratifying to find that a long list of durable accomplishments has been recorded, keeping faith with the promises made. Repeatedly, industry found that sales leaped because Service Men were able not only to install, service and maintain their equipment satisfactorily, but serve as technical mentors, where there were questions of efficiency, performance and even dollar value.

In audio, Service Men were significantly successful in proving their competence and essentiality. They braved the blizzards of complex terminology that raged during the entire year and produced not only clarifying comments, but outstanding service that kindled wide audio interest; thanks to religious attendance at professional symposia, extensive lab-field activities, and rabid reading of the literature‡ and such technical journal proceedings as the *audio forum.**

It was (and is) the Service Man's job to know (and tell others too) just why one selects a certain type of pickup, cartridge and stylus for a phono; pointing out, for instance, that one must look for a number of unusual mechanical, electronic and electroacoustical features. The records show that weight factors prompted a number of queries. It was necessary to stress the fact that a minimum of weight should obtain on the stylus to reduce record wear and surface noise. And yet we know, too, that the weight should be sufficient to keep the stylus properly in the recording groove. The pickup should be of the type requiring a minimum of pressure as the needle moves laterally in the groove to avoid any tracking difficulties, especially in the deep low frequencies; in other words the pickup should have high lateral compliance. Other accented features included points of resonance and needle talk. To avoid distortion, it was stressed, the system must assure freedom from points of resonance within the audible range. And there must be a minimum of needle talk or extraneous noise introduced by the contact between the stylus and the record.

Record players and their unique design factors were also on the *q* and *a* sheets. Here it was emphasized that players must insure smooth constant rotation, without speed change or wobble; and the motor should assure constant speed, through perhaps the use of 4-pole shaded pole type motors. Describing turntables, it was said they must be carefully balanced, and all moving parts properly supported and provided with good bearings to avoid production of mechanical rumble. Cushioned supports have also been found important, for they prevent the transmission of vibrations to the stylus which might be amplified in the form of disagreeable rumble or other noise. Some turntables are supported on a combination of spring and rubber layers.

Speakers and enclosures represented another vital element in the audio chain up for an evaluation. Probing speakers, Service Men must determine if adequate magnet weight obtains, and if the cones are of the proper size and design; also if the cone and voice coil suspension and spacing are adequate. Matching of speakers was also found to be quite a subject for deliberation. Reviewing this phase, it was noted that where more than one speaker is used, it is important that they complement and supplement each other, and are matched with the amplifiers through carefully-designed crossover networks, with the crossover taking place at the correct frequencies in accordance with each speaker's design. And in a complete *hi-fi* system; it was underscored, there should be a sufficient number of speakers to provide complete response and reproduction over the broad range desired.

Industry also found that Service Men were striving, with a dogged determination, to drive out the miscreants who were guilty of the five basic evils: Pulling sets out of homes unnecessarily; charging for parts not actually used; charging for new parts when used parts were installed; actually removing new parts and replacing them with used or inferior parts; and doing unnecessary work and then charging for parts that were not needed.

This job, a rough, tough one, has been tagged *operation must* by a growing number of angry Service Men and associations throughout the country. They have a rowdy problem on their hands, they readily admit, but they are eager to stop these corrosive, damaging practices.

And with so fiery a spirit on deck to spur them on, everyone is certain that they'll complete their mission.

Yes, Service Men have displayed a keen insight in industry problems, an acumen that has been inspiring and not only brought rewarding results this year, but set the stage for an even more stimulating era in the bright new year ahead.—L. W.

‡*With apologies to R. H. G. Mathews of the hi-fi division of Magnavox.*
**Appearing as a monthly feature in* Service.

by JACK DARR

Locating and Remedying

Technique Developed Revolves About Isolation

FIELD EXPERIENCES have highlighted the fact that most receiver troubles can be located more readily when one is thoroughly familiar with the characteristics of the assorted sections of a chassis. Thus, it becomes possible to centralize the problem and roaming checks can be substantially avoided.

The heater circuit offers an interesting illustration of the effectiveness of this approach. Although this is perhaps the simplest circuit in radio, many troubles originate here, especially in *ac/dc* models. The oldest and simplest filament arrangement of all is the straight-parallel circuit used in old battery sets and auto-radios, and in *straight-ac* sets, where we have a winding on the power transformer to supply the filament voltage. In battery receivers, the filaments of the tubes all use the same voltage (1.4 *v* in later models and 2 *v* in older ones) and are all connected in parallel across the *A* battery. Voltage and current relationships here are quite simple; the voltage is the same across each tube, and we have the current requirements of the battery or of the filament winding of the transformer in the total (added) drain of the tubes. For instance, when selecting a replacement for a power transformer, one adds up the current drawn by all tubes, including the rectifier, which has a separate winding. Let us say a set has five 6-*v* tubes, and a 5-*v* rectifier; the rectifier consumes 2 amperes, and has its own filament winding; the 6-*v* tubes each require .3 ampere. Five of the latter would thus require a total current of 1.5 amperes; therefore, we need a power transformer with 5-*v* and 6-*v* windings each capable of furnishing at least two amperes. The added capacity is necessary so that the transformer may run cool, and also have sufficient reserve rating to carry pilot lights, etc.

Next on the list, as far as simplicity is concerned, is the series-filament string used in *ac/dc* chassis. Here the tubes may use different voltages, but each must have the same current drain in the filament; current must be the same in all parts of a series circuit, although the voltage drops across different elements may vary widely. Tube types now in use include the 150-*ma* tubes, such as 12SK7, 12BA6, 12SA7, 12BE6, 35Z5, 50L6 and 35L6. Older models used 6A7, 6SA7, 6SK7, 25L6, 25Z6 and similar types, which required 300 *ma*.

Due to unavoidable line-voltage fluctuations and to provide a margin of safety, engineers use a *design-center* voltage of 117 volts. This means merely that the value of 117 is used for the line voltage when computing the circuit. Thus, all voltages will be within the required tolerance when 115 volts are applied to the circuit.

Let us suppose a circuit under study employs a rectifier, power amplifier, second detector (diode-triode), *if* amplifier, and a mixer-oscillator. Beginning with the rectifier, there are several types which can be used. In the octal-based family, we have 35Z5 and 35Z4 half-wave rectifiers with 35-*v* heaters, at a current drain of 150 *ma*. For the power tube, there is the 50L6, a pentode with a 50-*v* heater, also with 150-*ma* current. We have used up a total of 85 *v* and 32 *v* remain. To meet the 32-*v* requirement, the closest approach would be three 12-*v* tubes (12SQ7, 12SK7 and 12SA7) adding up to a total of 36 *v* rated. The total voltage for the whole string is 121 *v*. While this is above the design voltage of 117, the operation of the set will not be affected, as the heater-voltage tolerance of these tubes is extremely wide. That is, the 12-*v* tubes will work very well with only 8 *v*, and the higher-voltage types will work with about 75% rated voltage, with no apparent loss in efficiency. The added voltage rating serves as protection against line surges; in addition the tubes can run a bit cooler, prolonging their life.

In many instances, 35-*v* tubes, such as 35L6, have been deliberately replaced with 50-*v* types, to boost the line-rating a bit and lengthen tube life, where it is apparent that the set is subjected to frequent surges. Some designers have used 6-*v*, 150-*ma* tubes, such as 6SS7, which are electrically equivalent to the 12SK7, to produce a filament string that would come closer to the base voltage; in this instance we'd have a total of 115 *v*. Thus the 6SS7 may be replaced with a 12SK7, with no circuit changes, and an extra 6-*v* added to the string for protection.

When a tube heater is cold, its resistance is lowered greatly. Thus, when a set is turned on, overload currents of as high as 400% may pass through the filament string. This, of course, is of no help in attaining the desired long life of tubes. Therefore, designers of a number of recent models have introduced special resistors, known as *ntc* or *negative-temperature coefficient* resistors, into their filament strings. The resistors are made of a substance with a rather high resistance when cold, gradually dropping

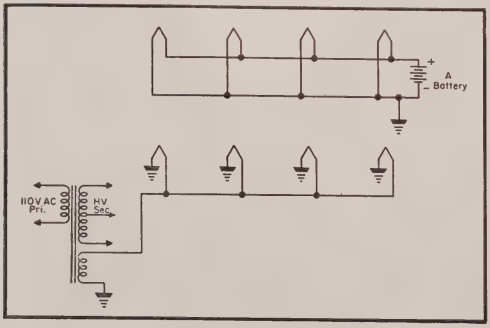
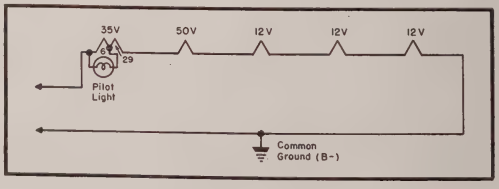


Fig. 1. A typical parallel-heater string, as found in old battery and straight, transformer-powered ac sets, and auto radios. It will be noted that one side of this type string may be grounded and one hot wire run to each tube.

Fig. 2 (below). Typical series heater string.



Faults In Heater-Filament Lines

of Troubles to Particular Circuit Based on Symptoms Offered

when heated. The most common cold-resistance value, found in small sets today, is 1200 ohms, which drops to around 200 when heated to operating temperature. The heat is supplied by the filament current passing through the resistor. Thus the harmful surge is eliminated, as the surge current rises very gradually, due to the high resistance in the circuit. These resistors can be installed in older sets, if due provision is made for the extra voltage drop across the *ntc* resistor. For instance, in a set with a 50L6, a 35L6 and an *ntc* resistor can be installed. A selenium rectifier might be substituted for a 35Z5, and the *ntc* resistor connected in place of the 35-volt filament. This will require a larger resistor; one with a hot resistance of approximately 250 ohms.

In most *ac/dc* sets, the filament strings usually follow the same pattern, as to their order of connection to the line. Beginning at the *hot* side of the line, the current goes through the rectifier heater, power tube, *if* amplifier, mixer, and always last, the first audio/second detector. The latter tube is always installed at the low end of the string, nearest to ground, to reduce the *ac* hum potential between its cathode and heater; it is the first audio amplifier (usually a high-gain triode), and hence quite sensitive to hum pickup.

Due to the series connection, another peculiar trouble is often encountered. It will be found that the cathodes of all tubes except the rectifier return to *B*—, or the common ground, which is the *low* side of the *ac* line. In *A*, Fig. 3, it will be noted that a heater-cathode short in either the 12SK7 or 12SA7 can cause a loss of heater voltage to the remaining tubes. The rest of the tube filaments would continue to burn, but they would be somewhat brighter, due to the increased voltage. However, this voltage is not usually high enough per tube to cause any serious damage, unless the set is left on for a rather long period.

Series-Filament Problems

By far the most common trouble in series-filament models is tube burnout. The circuit opens completely and the set goes dead; thus there's no high voltage and no filament voltage. This can be easily isolated by testing the tubes. A shortcut here is to apply a neon-lamp *line-checker*, with flexible probes, across the heater connections of each tube; the open filament will cause the lamp to light, as the full line voltage will be present across it. The same test may be made with an *ac* voltmeter, with at least a 150 *v ac* range. Continuity-testing will also locate the trouble. At times an intermittent-opening filament can cause much trouble. Most of these difficulties will be found in the two high-voltage tubes (rectifier and power-tube), but the low-voltage tubes are by no means immune, so one should beware of hasty conclusions. One must be very sure that the offending tube has been definitely located before sending the set home. One way to make sure that the trouble has been located is to connect the *ac vm* across the suspected tube, and then cook the set until the intermittent occurs; a neon lamp can also be used. If the correct tube has been selected, the neon lamp will light, or the *vm* will read full line voltage. A set of neon lamps with clips can be made up, and one lamp clipped across each tube in the set. Then, when the set goes, the defective tube will become immediately apparent.

One frequent trouble in *ac/dc* sets is burnout in the rectifier heater. This may be caused by a shorted-line bypass, a paper unit around .02-.05 mfd, usually connected from plate to common, or a shorted filter. The close-spaced half-wave rectifiers such as the 35Z5, 35Y4, etc., are particularly susceptible to this trouble. When this problem occurs it is usually wise to make an ohmmeter check at the rectifier socket before inserting a new rectifier; if there is a short, a new tube will be destroyed as soon as the set is turned on.

Three-Way Series-Filament Portables

The series-filament circuit employed in the *battery-electric* portables is a tricky affair. Since these sets must operate on dry-battery packs, low-drain battery tubes must be used. These are usually connected so that the *A* battery supplies a voltage equal to the sum of the filament voltages of all the battery tubes. This is done to simplify the task of switching the set from *ac/dc* to *battery* operation. A few portables have been designed with the tubes in parallel on *battery* and in series on *ac/dc*, requiring a complicated switching arrangement.

In a typical filament string, the filament voltage for the tubes is sup-

(*Continued on page* 54)

Fig. 3. A typical series-string circuit found in ac/dc models. Note compensating (ntc) resistor, and point A, indicating possibility of shorting out last tubes in string with a heater-cathode short in tubes.

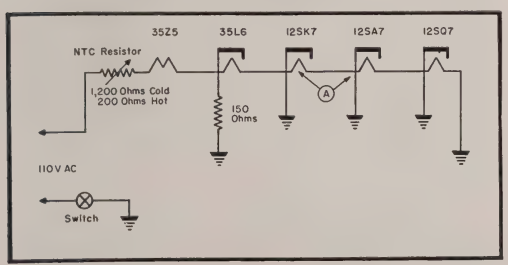
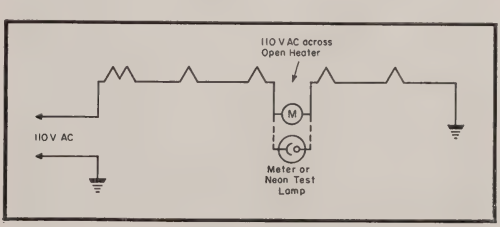
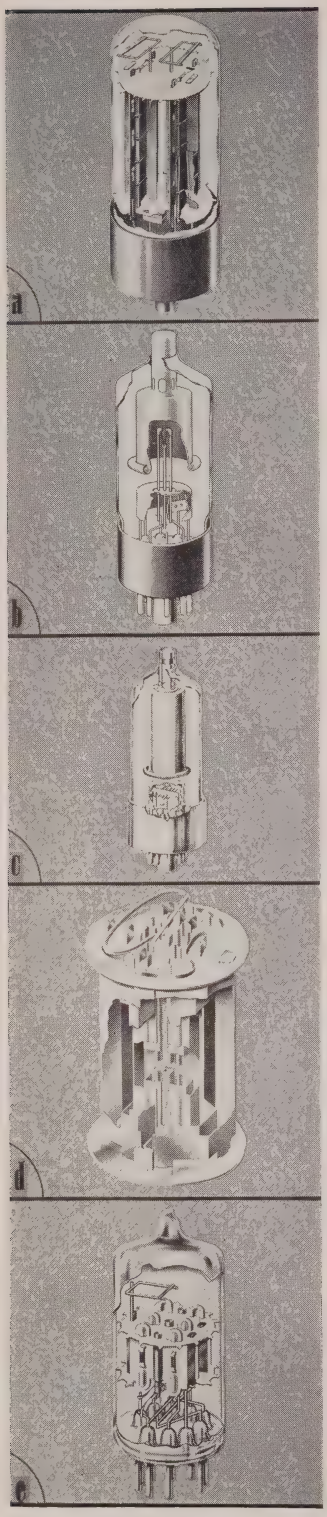


Fig. 4. Locating open filament in series string with voltmeter or neon test lamp. Full-scale meter reading must equal full line voltage; 150 vac scale preferable.





COLOR TV TUBES

by G. C. CHURCH

Technical Data Section, Receiving Tube Sub-Department, General Electric Company

THE FUNCTION OF THE color TV receiver is to reconstruct the red, green, and blue video signals and thus reproduce the original scene both in brightness and color. To provide this performance, the color set requires many more stages and is considerably more complicated than the monochrome models.

The head end and the *if* amplifiers in the color chassis are about the same as for b-w, except that the bandwidth must be sufficiently wide so that the chrominance information will not be lost. Also, greater attenuation of the sound carrier is needed in the *if* stages to minimize the possibility of the approximately 920-kc beat between the sound carrier and the color subcarrier. These requirements necessitate the use of higher stage Qs and improved trap circuits and possibly additional amplifier stages. The extra attenuation of the sound carrier also requires that the sound signal be taken off ahead of the high-attenuation sound traps. Therefore, one tube is used as the sound and chrominance detector, and another as the luminance detector. The audio system requirements are the same as for monochrome receivers. The luminance detector and luminance amplifier correspond to the video detector and video amplifier in a b-w receiver. The sync amplifier, noise cancellor, sync clipper, *agc*, vertical sweep, horizontal *afc* and sweep, deflection yoke, high-voltage rectifier, vertical blanking, horizontal blanking (vertical and horizontal blanking stages are omitted in most, but not all monochrome sets), and power supply all perform the same functions in a color set, as in a b-w set.

Many of the new functions can be performed by already-existing tube types, while some can be accomplished easier or better by new tubes.

To meet some of the special color-set requirements there has been developed recently a set of tubes for the following applications: High-voltage rectification (2V2); full-wave power rectification (5AU4); synchronous detection (6AR8); *dc* restoration (6BJ7); and high-voltage regulation (6BU5).

The 5AU4, a filamentary full-wave high-vacuum rectifier, has the same base connections as the 5U4G. In full-wave operation with a supply voltage of 300 *v rms*, the tube is capable of delivering a *dc* output current of 350 ma. A color receiver requires two or three times more current than a b-w set; two of these rectifiers should fill the requirements of most color receivers. In addition, it has been found that a single rectifier of this type can usually supply the current necessary for b-w receivers which would otherwise normally require two rectifier tubes in parallel; such as two 5U4Gs or one 5U4G and one 5Y3GT. In conventional full-wave rectifiers using tubes in parallel, with capacitor-input filters, a certain amount of resistance is needed in series with each plate to keep steady-state peak current and hot-switching current within ratings. If the associated power transformer does not have sufficient resistance, external resistances should be added in series with each plate. The steady-state peak current maximum rating of the 5AU4 is 1075 ma and the hot-switching current maximum rating is 5.25 amperes.

The 2V2 high-voltage rectifier, designed to supply power to the anode of the picture tube, is intended primarily for use in flyback types of power supplies. The comparatively high inverse voltage and average current capabilities of this tube make it suitable for use with color or monochrome picture tubes which operate at high anode voltages. The tube has the same basing as the 1B3GT, except that the filament is center-tapped. The tapped filament enables the tube to be

(Left)
Cutaway views of (top to bottom) 5AU4 (a: **full-wave power rectifier**); **2V2** (b: hv **rectifier**); **6BU5** (c: hv **regulator**); **6AR8 mount** (d: **sync detector**); **and 6BJ7** (e: dc **restorer**).

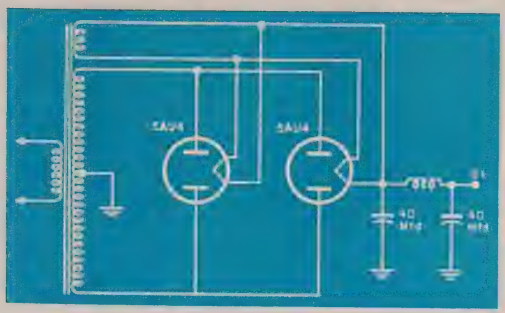


Fig. 2. Conventional full-wave power supply using pair of 5AU4s in parallel with capacitor-input filter.

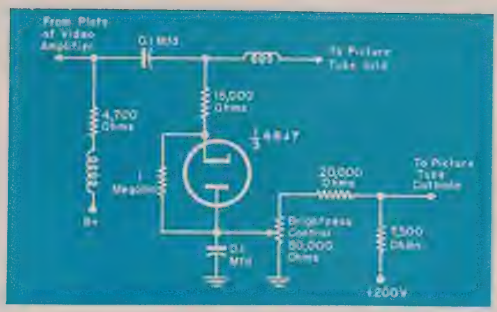


Fig. 3. Schematic of a dc restorer in which one section of the 6BJ7 is used as a dc restorer for one of the signal channels. Circuit shown is for a negative-going signal.

used with either 2.5 *v* at 200 ma or 1.25 *v* at 400 ma on the filament.

The 2V2 has a tube drop of approximately 150 *v* at 7 milliamperes *dc*.

The maximum ratings of this *hv* rectifier permit a single tube to supply the *hv* requirements of a 15″ 3-gun color picture tube. For 19″ 3-gun color picture tubes, two 2V2s may be used in a voltage doubler circuit.

The 6BU5, a low-current, high-voltage beam pentode, has been designed primarily for use as a shunt voltage regulator in the *hv* power supply of color sets. At present, it carries a maximum plate voltage rating of 20,000 and a maximum plate dissipation rating of 20 watts. These ratings are based on the use of the tube in conjunction with a 15-inch picture tube which requires 20,000 volts. A higher-voltage version of this tube, now under development, will permit its use with the 19-inch models which require 27,000 *v*. The 6BU5 has an octal base and requires a heater voltage of 6.3 and a heater current of 150 ma.

The 2V2 operates just as the *hv* rectifier does in a b-w receiver. As the horizontal output tube is driven to cutoff, the rapidly decreasing current in the horizontal output transformer causes a high positive voltage pulse to be impressed upon the plate of the tube; thus it conducts and charges a capacitor C_1 in Fig. 5. The 6BU5, placed in shunt with this capacitor, servers to regulate the rectified voltage. It has been found that proper regulation of the high voltage is needed to prevent picture registration and the size of the picture from being functions of the beam current of the picture tube. The total beam current of a 3-gun picture tube can vary from zero to about 600 or 800 microamperes. Without regulation, this wide variation in current would cause intolerable variations in second anode voltage. As illustrated, series-connected bleeder resistors totaling approximately 120 megohms are tied across the high voltage. Grid *1* of the 6BU5 is connected to a 1-megohm potentiometer in the bleeder circuit. Adjustment of the 1 megohm potentiometer varies the voltage on grid *1* and thus provides a means of adjusting the high voltage to 20,000. After adjustment, the regulator will keep the high voltage within about 400 volts of the 20,000 for picture-tube total-beam current up to one milliampere.

For zero picture tube current, the regulator tube will be conducting heavily. With the high voltage adjusted for 20,000, the regulator plate current will be about one milliampere. As the picture tube begins to draw current, the high voltage drops because of the inherent poor regulation of the *hv* supply. As the high voltage drops, the point at which grid *1* is tapped off the bleeder also drops in potential. Since the reference voltage is essentially constant, this causes grid *1* to become more negative with respect to cathode, which in turn reduces the current drawn by the regulator, compensating for the increase in picture tube current. The regulator, then, in effect, tries to maintain a constant drain of current from the *hv* source and thus maintain constant voltage. As the picture tube draws more beam current, the regulator tube draws less plate current, and as the picture tube draws less beam current, the regulator tube draws more plate current.

The 6AR8, a miniature double-plate *sheet-beam* tube, was designed primarily for use as a sync detector in color television receivers. To get current of the proper magnitude, the tube is constructed so that the cathode

(*Continued on page* 46)

Fig. 4. Diagram of sync detector system using pair of 6AR8s for I and Q.

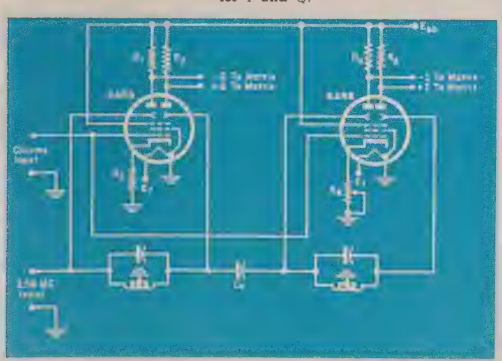
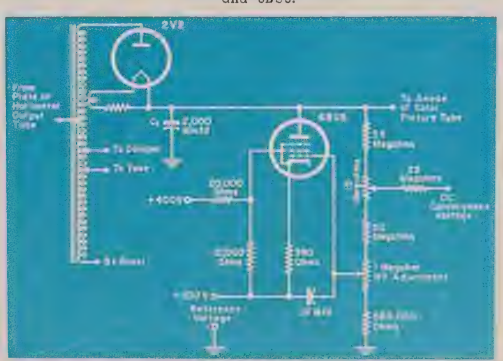


Fig. 5. Schematic of hv rectifier and hv regulator using 2V2 and 6BU5.



Shifting IFs To Curb TVI

Techniques and Instruments That Can be Used to Provide Required IF Bandpass Shifts

by **T. B. AITKEN**, *District Service Manager, The Magnavox Co.*

To ACCOMPLISH the shift of the *if* bandpass or Δ_{if} complete readjustment of the tuned circuits is necessary, as noted earlier.‡ And as far as alignment procedure is concerned, it is best to adhere to each individual manufacturer's specifications.

In this instance, the frequency points stated will be shifted by Δ_{if}. If the manufacturer's specified tuned frequency for a certain transformer is represented as T_{ms}, then the shifted tuning for this transformer may be written as:

$$T_{ms} - \Delta_{if}$$

In the same terms, the shift frequency of a coil represents

$$L_{ms} - \Delta_{if}$$

Referring to the *if* system, illustrated in Fig. 1, the frequency for which T_1 will be aligned, will be:

$$T_{1ms} - \Delta_{if}$$

The new frequency for each tuned circuit of this system is derived in the same manner. In performing the actual alignment, there are any number of methods that might be used, depending on the particular test equipment that is on hand. It is important to establish the basic frequency alignment points regardless of the method selected.

One method found very accurate features use of an unmodulated signal generator and *vtvm* which will present peak indication of each slug adjustment. This procedure involves connecting the *vtvm* across the video detector load resistor, R_1, in Fig. 1. The signal generator is then connected to the grid of V_3 (point *a*) and tuned for $T_{3ms} - \Delta_{if}$. The slug of T_3 is adjusted for maximum indication on the *vtvm*. The signal generator's output is then moved to the grid of V_2 (point *b*) and tuned for $T_{2ms} - \Delta_{if}$. T_2 is next adjusted for maximum indication on the *vtvm*. Since the *if* system illustrated has the adjacent channel trap incorporated in the second *if* transformer (top slug), this adjustment is next. The signal generator must be tuned to the frequency of the *TVI* (equivalent to the trap frequency less Δ_{if}), and the trap (T_2 top slug) adjusted for minimum indication on the *vtvm*. The signal generator is then connected to the grid of V_1 (point *c*) and tuned for $T_{1ms} - \Delta_{if}$. T_1 is adjusted for maximum indication on the meter. The signal generator is now connected to the mixer grid (point *d*) and first tuned to $L_{1ms} - \Delta_{if}$. Coil L_1 is peaked for maximum *vtvm* reading; then the generator is retuned to $L_{2ms} - \Delta_{if}$. The mixer plate coil L_2 is adjusted for maximum *vtvm* indication. Following this procedure, a sweep generator and marker is connected at the mixer grid and a 'scope across R_1 for a visual observation of the shifted *if* bandpass. It may be necessary to touch up the slug adjustments to produce the response curve shown in Fig. 2 (solid line), within the respective production tolerances, of course.

Another method is to sweep align each stage. This involves a sweep generator, marker generator, and a 'scope equipped with both a detector probe and low capacitance probe. T_3 (Fig. 1) is aligned by connecting the 'scope (low-capacitance probe) across R_1, and the sweep generator with marker at the grid of V_3; point *a*. The pattern displayed on the 'scope is illustrated in Fig. 3*a*; *dotted line*. The marker generator when tuned to T_{3ms} places the marker at the top of the dotted curve. Tuning the marker generator now to $T_{3ms} - \Delta_{if}$ and adjusting the slug of T_3 will shift the curve to that of the solid line in Fig. 3*a*. The detector probe of the 'scope is then connected to the plate of V_3, and the sweep generator with marker is connected to the grid of V_2; point *b*. The response of T_2 presents the pattern on the 'scope equivalent to Fig. 3*b* (dotted line) and the marker will be on the peak of the curve when adjusted to T_{2ms}. Adjusting the marker to $T_{2ms} - \Delta_{if}$, the slug is aligned to produce the peak portion of the solid curve of Fig. 3*b*. For the trap adjustment, the marker generator is tuned to the frequency of the *TVI* (equivalent to the trap frequency less Δ_{if}) and the right hand *dip* portion of the curve is adjusted to the solid line of Fig. 3*b*. With the detector probe of the 'scope connected to the plate of V_2 and sweep with marker connected to the grid of V_1 (point *c*), T_1 is then adjusted in the same manner as T_3. The detector probe of the 'scope is connected to the plate of V_1 and sweep generator with marker to the mixer grid; point *d*. This will present the response pattern shown in Fig. 3*c; dotted line*. The marker pips will be at each peak when the marker generator is tuned to L_{2ms} and L_{1ms}, respectively. Adjusting both L_2 and L_1, the solid line curve of Fig. 3*c* will be obtained with the marker points at $L_{2ms} - \Delta_{if}$ and $L_{1ms} - \Delta_{if}$, respectively. Replacing the 'scope detector probe with the low-capacitance probe and connecting it across R_1, the overall *if* response can be visually observed. Here again touch up might be necessary.

These two methods have been described because of variations of test equipment available and in use. The second procedure has been detailed because some test equipment can only produce a sweeping frequency with a marker injected in it. It is impossible to employ the first method with this type equipment; however, other types make the first very practical. Nevertheless, both procedures serve satisfactorily in their purpose of establishing the basic primary alignment points.

Considering the foregoing example of a receiver that is subjected to the severe 43.5-mc *TVI* signal, the first method is applied for the alignment of this receiver to the new specifications of the Δ_{if} shift. Referring to the dotted curve of Fig. 2, the adjacent channel trap setting (top slug) is 47.25 mc; picture carrier point 45.75 mc; and sound carrier point, 41.25 mc. The new alignment points will be shifted by the amount Δ_{if}, or in this case 3.75 mc. This will make the new adjacent channel trap frequency 47.25 – 3.75 or 43.5 mc (the *TVI* fre-

‡SERVICE: November, 1954.

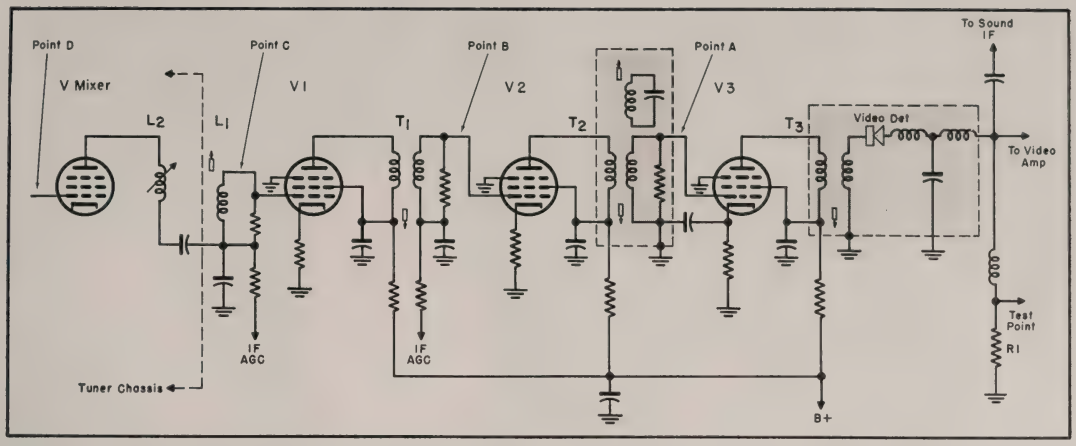


Fig. 1. A typical stagger-tuned if system, including the mixer stage of a tuner, shown because in most receivers the mixer is involved in if alignment; a, b, c and d represent alignment test points using an unmodulated signal generator and a vtvm.

quency). The picture carrier point now will be 45.75 – 3.75 or 42 mc, and the sound carrier point 41.25 – 3.75 or 37.50 mc. The manufacturer's specified frequencies for the tuned circuits of this *if* system are:

$T_{1ms} = 43.40$ mc $T_{2ms} = 45.25$ mc
$T_{3ms} = 44.50$ mc
$L_{1ms} = 43.85$ mc $L_{2ms} = 43.30$ mc
$T_{2\,trap\,ms} = 47.25$ mc

The signal generator alignment frequencies then will be:

$T_{1ms} - \Delta_{if} = 43.40 - 3.75$ or 39.65 mc
$T_{2ms} - \Delta_{if} = 45.25 - 3.75$ or 41.50 mc
$T_{3ms} - \Delta_{if} = 44.50 - 3.75$ or 40.75 mc
$L_{1ms} - \Delta_{if} = 43.85 - 3.75$ or 40.10 mc
$L_{2ms} - \Delta_{if} = 43.30 - 3.75$ or 39.55 mc
$T_{2\,trap\,ms} - \Delta_{if} = 47.25 - 3.75$ or 43.50 mc

The *vtvm* should be connected across the video detector load resistor, R_1, in Fig. 1, and the signal generator connected to the grid of V_3 (point *a*) and tuned for 40.75 mc. Then T_3 is adjusted for maximum indication on the *vtvm*. The signal generator then should be connected to the grid of V_2 (point *b*) and tuned for 41.50 mc; T_2 (bottom slug) being adjusted for maximum indication on the *vtvm*. Then the signal generator can be tuned for 43.50 mc (the *TVI* frequency) and the trap (top slug) adjusted for minimum *vtvm* indication.

The signal generator should then be connected to the grid of V_1 (point *c*) and tuned for 39.65 mc; T_1 being adjusted for maximum indication on the *vtvm*. Then the signal generator is connected to the mixer grid (point *d*) and first tuned to 40.10 mc; L_1 is adjusted for maximum indication on the *vtvm*. Then the signal generator should be tuned to 39.55 mc and L_2 adjusted for maximum indication on the *vtvm*. In the next step a sweep generator and marker is connected to the mixer grid (point *d*) and 'scope across R_1, for a visual check of the *if* response. A slight touchup may be necessary for the curve to correspond with Fig. 2 (solid line), with the picture carrier at 42 mc and the sound carrier at 37.50 mc. Thus, the *if* portion of the example receiver has been shifted.

Since the *if* band has been shifted, the tuner will now be producing the incorrect output. The heterodyning between the local oscillator and the *rf* pass band in the tuner must be such that it provides the proper frequencies to coincide with the *if* response. To obtain this then for the new *if*, the local oscillator must be shifted in its respective channel frequency to produce the correct *if* for the new or shifted *if*. This shift of the local oscillator will be, by the same amount as the *if* shift or Δ_{if}. The local oscillator will then heterodyne with the carriers of a channel forming the correct *if* carrier points to correspond with the *if* response shown in Fig. 2; *solid line*. Because, in most cases, the shifted *if* bandpass is lower than its original setting, the oscillator will be lower in its oscillating frequency. This means that more inductance of the oscillator coil will be required. In some tuners the mounting position of the coil must be changed for adjustment; others have slug-tuned oscillator coils. On the slugless type, the coil should be squeezed together and the loop of the turns made larger. On the slug-type adjustment, the slug must be moved further into the coil to create more inductance. In most tuners, tuning of each channel can be obtained by adding inductance as it is tuned from the highest frequency channel down. This means that it is best to begin the local oscillator adjustment on *vhf* tuners with channel *13* and proceed down. The same procedure will apply to *uhf* tuners; *uhf* converters require no adjustment since their output is a *vhf* channel signal. If the lower chan-

(*Continued on page 52*)

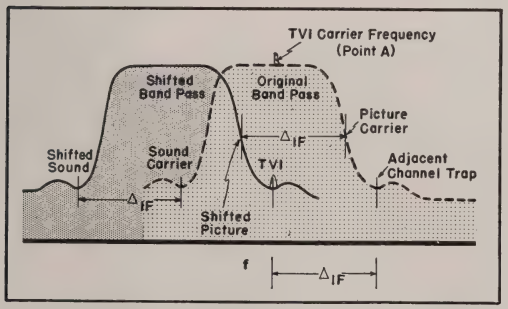
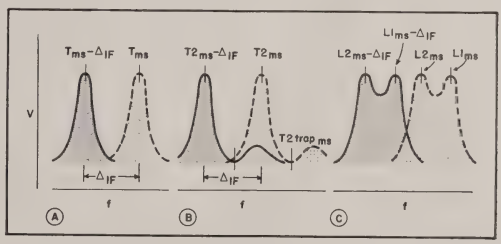
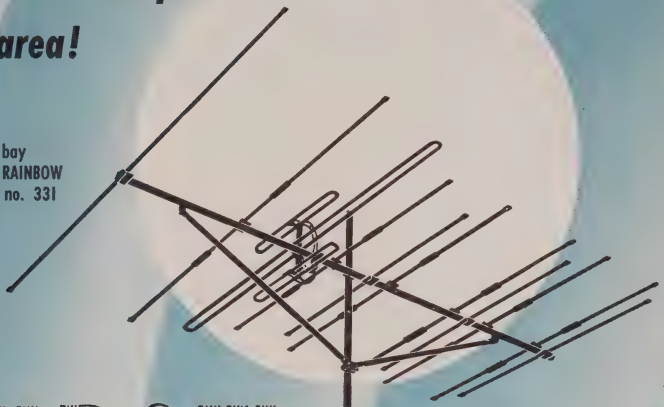


Fig. 2. Curves illustrating a shifted if response. A change in the bandpass is represented as Δif.

Fig. 3 (below). Patterns obtained on 'scope during sweep alignment.



this great all-channel antenna discovery is smashing sales and performance records in every TV area!



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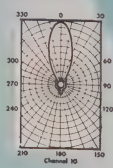
Other Patents Pending

CHANNEL MASTER *creative engineering*

Here's how the RAINBOW out-pertorms the famous Champion:

	CHANNEL	2	3	4	5	6	7	8	9	10	11	12	13
Gain Over 1-Bay Champion	1-Bay RAINBOW	0 DB	0 DB	0 DB	+1 DB	+2 DB	+3 DB	+2.5 DB	+1 DB	+.5 DB	+.5 DB	+1.5 DB	+2.5 DB
	1-Bay SUPER RAINBOW	+1 DB	+1 DB	+1.5 DB	+2.5 DB	+3.5 DB	+3.5 DB	+3 DB	+2 DB	+1.5 DB	+2 DB	+3.5 DB	+4.5 DB
	CHANNEL	2	3	4	5	6	7	8	9	10	11	12	13
Gain Over Stacked Champion	Stacked RAINBOW	+1.5 DB	+2 DB	+1.5 DB	+1.5 DB	+2 DB	+.5 DB	+.5 DB	+0 DB	+0 DB	+0 DB	+1 DB	+1.5 DB
	Stacked SUPER RAINBOW	+2 DB	+2.5 DB	+3 DB	+3 DB	+4 DB	+.5 DB	+1 DB	+1 DB	+2 DB	+2 DB	+2.5 DB	+3.5 DB

horizontal polar pattern (relative voltage)



for fringe and super-fringe areas:
Super Rainbow, model no. 331
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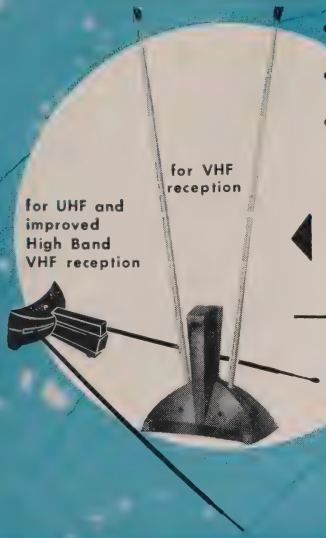
something new in indoor antennas



- features 3 telescoping sections.
- tilt-proof polystyrene base — cannot tip over.
- handsomely packaged for display.

the ALL-VU*

*all VHF . . . all UHF

the only indoor antenna with this "2-Way" feature.

model no. 381 **$6.95 list**

---

the PRE-VU

for all-channel VHF reception only.

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ALUMast

Aluminum Masting. The new idea in antenna masting—

can never rust!

- in telescoping sections
- in swaged 5, 10, and 14 foot sections

Lightweight ALUMast is ⅓ the weight of steel, making it so easy to install — it swings right up! Stronger than steel, ALUMast is easier to stock and actually more economical.

brings you today's 5 newest installation ideas

for . . . more effective installations

. . . greater customer satisfaction

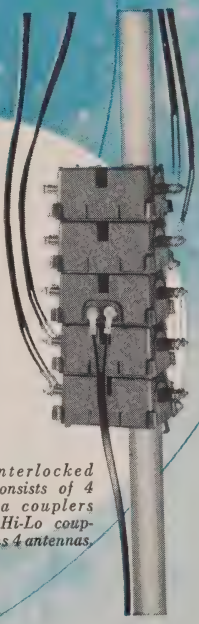
. . . higher profits for you!

SELECTENNA COUPLING SYSTEM

permits unlimited antenna combinations with only one transmission line!

- for the first time, you can tie together an unlimited combination of antennas, including separate antennas operating on the *same band.*
- ideal for areas currently using rotators, manually-operated selector switches, and "omni-directional" antennas.

list price:
$5.42 each
including hardware and wire for joining couplers.



This interlocked stack consists of 4 antenna couplers and 1 Hi-Lo coupler; joins 4 antennas.

TV ROTATOR

with features found in no other rotator today:

- flexible worm gear, built-in thrust bearing.
- removable motor, electrical and mechanical stops.
- weatherproof, lightweight, strong.
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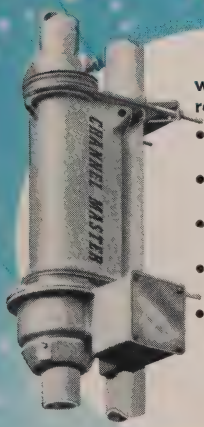

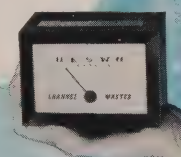

Beautifully-styled cabinet has great consumer appeal — is smallest on market (2¾" x 4"). Finger-tip control bar.

model no. 9521, **$49.95** list

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CHANNEL MASTER CORP. ELLENVILLE, N. Y.

WORLD'S LARGEST MANUFACTURER OF TELEVISION ANTENNAS

Balanced Concentric-Line Ultrahigh Converter

[*See Front Cover*]

ULTRAHIGH WIDE-BAND requirements have prompted the development of a number of unusual approaches in tuning and circuitry.

To illustrate, in the circuit[1] shown on the cover, this month, and in Fig. 1, we find that a single tube, 6AB4, is used as a neutralized grounded-cathode *if* amplifier.

To minimize spurious response, die-cut tuning rings have been incorporated. These tuning rings comprise the stator of a triple section tuner, which is made up of a double-tuned preselector and oscillator tuning sections, operating synchronously. The tuned elements are sliding-contact balanced concentric lines. This tuning system actually consists of a balanced adjustable lumped inductance, tuned by a fixed lumped capacitance.

(Below)

Fig. 1. Schematic of B-T model BTU-2 balanced concentric-line ultrahigh converter with neutralized grounded cathode if amplifier; see cover.

Dual Speed Tuning Mechanism

The tuning mechanism is a dual-speed device; a large indicator dial is mounted on the shaft of the tuner, and fine tuning can be accomplished by a vernier knob actuating a dial cable linked to the tuner shaft.

Other Circuit Features

Other interesting circuit innovations include a grounded $B+$; instead of remaining *hot*. A grounded-plate oscillator circuit offers lower inductance connections. And a double-tuned *if* transformer avoids a *dc* insulation problem, since both coils are connected to ground.

A 6T4 makes use of a *Colpitts* oscillator (grounded-plate circuit) which is grounded for *ac* and *dc*, eliminating decoupling capacitors.

A crystal is mounted in a specially designed coax holder; this has been found to reduce series inductance, and improve the noise factor at higher frequencies.

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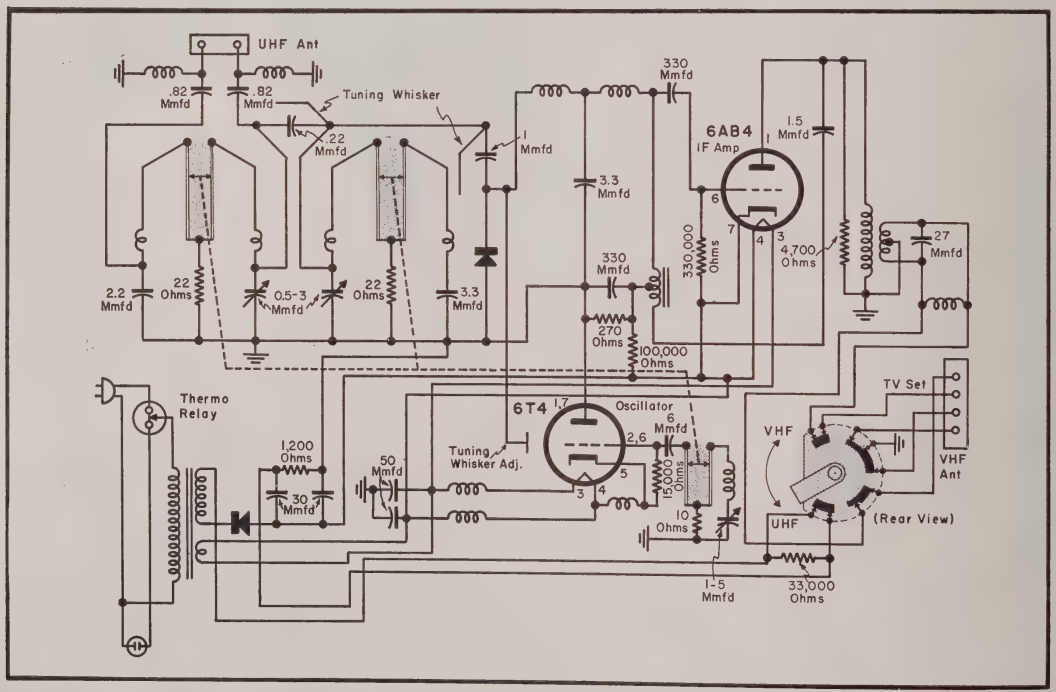
[1]*Blonder-Tongue model BTU-2 Ultraverter.*



Service Engineering — field and shop notes

by THOMAS BEAMER

Automatic Speech-Eliminator Performance Factors

MANY HAVE often stated that they would like to include some device or circuit in their receiver that would eliminate speech interruptions, so that only musical portions of a program would be heard.

As the result of one study of this requirement, an unusual speech-free service system has been developed.[1]

In this approach a device serves to distinguish between speech and music by responding to the difference in the nature of audio level changes. Both music and speech contain rapid increases in level, but in speech, the level drops more rapidly than in music, and deep drops can occur more frequently. The average rapid drops in level, of speech sounds, have a rate of decrease of about 400 db per second, a total drop amplitude of roughly 2 db, and a duration of roughly 50 milliseconds.

In the system, the input signal is taken from the audio portion of the set (TV or broadcast). During speech a negative *dc* voltage is fed back to the radio and used to cut off one of the audio amplifiers in the radio to silence the speaker. The input signal is taken from a point where the audio signal is not affected by this bias. Thus the device can continue to monitor the program material and will remove the negative voltage when speech has ceased.

The average level of the input signal may vary with program material, radio volume control setting, and type of receiver. An amplifier with *avc* maintains a nearly constant average level at its output for variations of over 60 db in the input signal. A band-pass filter passes the vowel sounds, but rejects hum and sibilant sounds which tend to reduce the depth of the rapid level drops.

This amplified signal is rectified in a *level detector*, the *dc* voltage output of which is a measure of the signal level. Filtering is such that the output follows the rapid drops of speech, but does not respond to impulse noise, which is the most prevalent type of radio static.

A *logarithmic amplifier* provides an output with constant voltage per db of signal level change, regardless of the program level at which it occurs. A 24-db drop produces twice as much output voltage as a 12-db drop, whereas the corresponding inputs to this amplifier only differ by 25%.

The time constant of the differentiating circuit was chosen so that the average rapid changes in level of speech sounds would not be attenuated, but slow changes such as the slower drops frequently found in music, would be greatly attenuated. At the output of this circuit rapid level drops appear as positive pulses and rapid level increases appear as negative pulses.

Since rapid level increases and rapid drops of small amplitude do occur in music, a *pulse selector* and *threshold circuit* have been included to reject pulses from these level changes, by passing only positive pulses and only those large enough to overcome the threshold bias.

Since there are types of program material, such as patter songs with faint orchestra, which lie between the two extremes of stentorian speech and symphony music, and which might be classified as either speech or music depending on individual preferences, a sensitivity control has been provided and included on the front panel. This control varies the amount of degenerative feedback around the pulse amplifier.

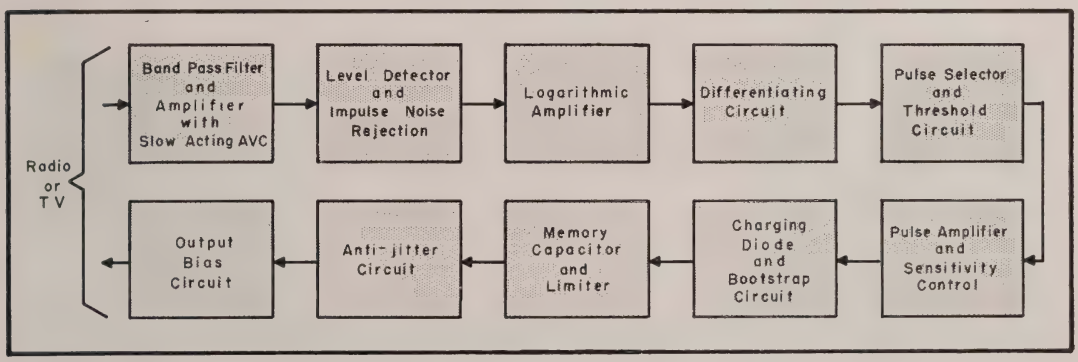
The output of the pulse amplifier is connected through a diode to a *memory capacitor*. This capacitor charges quickly through the diode, but is discharged slowly through a high resistance. The charge at any time on the capacitor depends on the amplitude and frequency of the pulses which have occurred during the last few seconds. This is a measure of the speechlike character of the signal.

A *bootstrap* charging circuit is used so that pulses of the same amplitude have the same effectiveness, regardless of what charge is already on the capacitor. The maximum charge on the capacitor is limited so that speech with many rapid deep drops will not excessively charge the capacitor. The normal pause between the end of speech and the beginning of music is then

(*Continued on page* 45)

[1]Vocatrol.

Fig. 1. Block diagram of automatic speech eliminator.


Radio or TV
Band Pass Filter and Amplifier with Slow Acting AVC
Level Detector and Impulse Noise Rejection
Logarithmic Amplifier
Differentiating Circuit
Pulse Selector and Threshold Circuit
Pulse Amplifier and Sensitivity Control
Charging Diode and Bootstrap Circuit
Memory Capacitor and Limiter
Anti-jitter Circuit
Output Bias Circuit

by H. BRAVERMAN

TUBE News

Selenium-Tube Rectifier Analysis: Voltage-Temperature Ratings, Regulation and Life Characteristics

THE MAXIMUM plate-voltage rating of a tube rectifier is set by a number of factors, the most important being the spacing between the leads brought out in the tube base. Practical tube design dictates that the plate and cathode leads be on opposite ends. In a full-wave rectifier circuit, the polarity of the plate voltage reverses during half the cycle making the plate negative and cathode positive.

This is best illustrated by a basic rectifier circuit, where one tube is conducting (short circuit since it has a negligible voltage drop), and the other is not passing current and hence is considered an open circuit. However, there is a potential on the latter tube which is opposite to normal operation and is equal to the *rms* voltage of the full secondary winding of the transformer to which it is connected.

The voltage which a selenium rectifier cell is capable of withstanding before puncturing is referred to as the *rms* reverse voltage per plate. Industrial power cells (those possessing good life characteristics) have ratings of 26, 33, 36, and 40-volts *rms* per plate. It is these 40-volt plates which are referred to in the following discussion.

The 5Y3 full-wave rectifier has a reverse *rms* voltage rating of 800 with a 4-mfd capacitive load.

A selenium rectifier with 20 plates in each arm, also has a reverse *rms* rating of 800 volts. This rectifier, using 1" square plates at a 35°*C* ambient, has a *dc* rating of 230 *ma*. Derating the load current 20% for capacitive load and 20% again (normal for 40 plates on one stud) to keep down the temperature rise and, subsequently, aging, brings the current down to 145 *ma*.

The output voltage of any type of rectifier tends to decrease as the output current from it is increased. This is called voltage regulation and is found by the formula: Per Cent Regulation = No Load Voltage-Full Load Voltage × 100/Full Load Voltage. The lower the percentage, the better the regulation.

Selenium rectifier power supplies have been found to offer better regulation than conventional tube power packs because larger capacitances (100–1000 mfd) can be used in the filter circuit, thereby improving the regulation considerably. Filter capacitances larger than 40 mfd cannot be used with a 5Y3 unless the plate supply impedance is increased. This can be done by adding a resistor in series with the transformer winding to limit the peak plate current to its rated value.

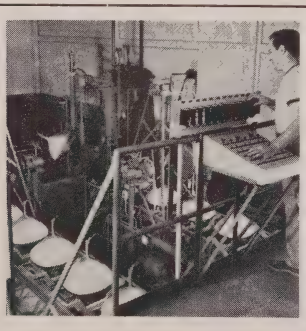
Temperature Ratings and Life

The 5Y3 can be operated without derating either the output current, input voltage or filament power in an ambient temperature range of —55° to +150°*C*. This upper figure is fixed, so that the maximum bulb temperature for long life operation does not exceed +180°*C*. The 30°*C* rise is contributed by the internal heat losses in the tube itself.

The life of a tube rectifier is indeterminate because of the vagaries of filament burnout and excessive electron emission. Most tube rectifiers are guaranteed by manufacturers to have a life of approximately 2000–5000 hours. To improve the reliability (reduction of early life failures) many manufacturers and industrial users stabilize the electrical characteristics and eliminate early mechanical failures by pre-burning the tubes for approximately 50–100 hours under conditions which simulate the intended application.

Field and lab experiences have shown that the selenium rectifier can be operated in an ambient temperature range of —55°*C* to +35°*C* without

(*Continued on page* 45)



(Left)
Aluminized picture tube screen settling room at Sylvania Seneca Falls, N. Y. plant. One man can control movement of bulbs as they move through room to next operation. Here, after a precise period of screen settling, automatic suction arms lift bulbs from the line as they spill chemical solution into troughs. Arm then gently deposits bulbs on screen-drying conveyor.

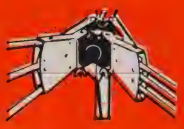
(Right)
In the aluminizing process of a picture tube, a small amount of aluminum is attached to a tungsten filament, mounted on two rods inside the bulb. Then a vacuum is created inside the bulb. As the temperature of the tungsten filament is increased, the pure aluminum melts and then vaporizes. This aluminum vapor settles or condenses on the inside walls and face of the bulb, and becomes a conductive and mirror film. (Courtesy Sylvania.)

BRAND NEW FEATURES

THAT MAKE *TRIO* THE LEADER IN '55

HEAVIEST BOOMS!

Thick - wall, extra - sturdy 1¼" diameter Booms. Nothing approaching them for strength! Now used on **ALL** low-band yagis.



New "VARI-CON" HEAD

Four Hi-strength aluminum adjusting arms. Interlocking Butterfly sections. Heavier snap-action spring assembly. The "Vari-Con" is the only antenna with spring dampeners to lessen vibration and breakage. The "Vari-Con" head also used on the popular TRIO 88 Series.

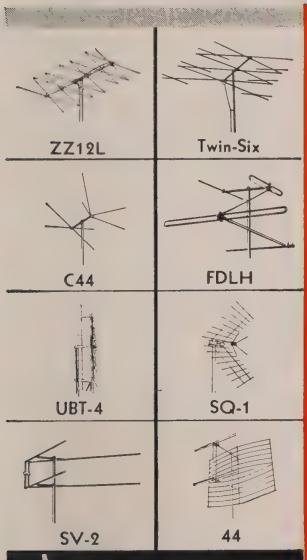
Sensational INSTA-LOK CLAMP (Good-Bye Nuts)

This revolutionary clamp permits instant flip-out assembly, permanent alignment with ultra strength. Nothing stronger — nothing faster! Insta-Lok employed on **ALL** TRIO Antennas that have parasitic elements.

New MINIT-UP CONICAL HEAD

Swing out element mounting plates, fan out elements into snap-fastenings and it's set! Used throughout conical line.

New MYCASTYRENE INSULATORS USED THROUGHOUT TRIO LINE

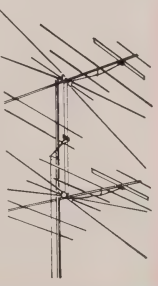


New TRIO ARISTOCRAT ROTATOR

NOW AVAILABLE IN **FOUR** GLORIOUS COLORS!

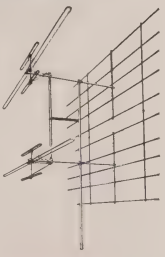
TRIO 88

Far superior construction. Rugged, foolproof — easily installed. Parasitic elements supported by TRIO's revolutionary new "Insta-Lok" clamps. Low channel dipoles supported by the strongest conical head made. No vibration — No element shedding. Completely pre-assembled. Available in single or two bay models.



TRIO 66

Three dipoles provide exceptionally high gain on all VHF channels. Exclusive TRIO grid reflector gives improved performance. Extremely rugged yet lightweight. Pre-assembled — simply unfold and tighten reflector and dipole assemblies. Three vertical braces on reflector screen for increased strength. Available in single or two bay models.



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TRIO Manufacturing Co.
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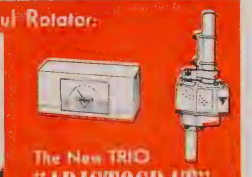
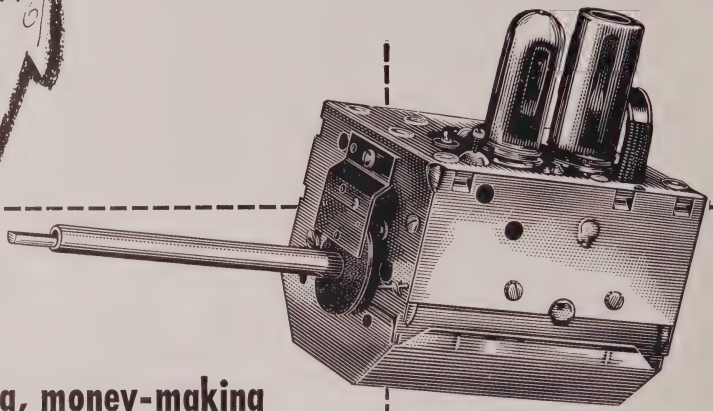


TRIO Leader in Antenna Development

NOW! Any TV serviceman may ADD $60, $100 OR MORE A WEEK TO GROSS PROFITS!



Share in the big, money-making tuner replacement market!

Hundreds of TV set owners in your community will welcome the sharper, stronger pictures afforded by newer, more powerful Standard cascode and pentode tuners. And a completely new Standard replacement tuner often costs your customer *less* than the parts and labor required for a major repair to the original tuner.

Approved Standard Tuners Install Faster, Easier!

Standard replacement tuners have shafts and leads easily cut to fit any set. In most jobs the tuner mounts into the space occupied by the original tuner with no alteration of the cabinet front.

Get Extra Profits Through Easy Conversion to UHF!

Set owners demand adaptability to UHF—and get it when you install Standard replacement tuners. Standard UHF conversion strips are priced to sell, permit easy, perfect tuning, and require no outside cabinet, adjustments, wires or extra parts of any sort.

Sell **Approved**

STANDARD TV REPLACEMENT TUNERS TV-2232—TV-1532

Super cascode and pentode models designed and built *especially* for the replacement market

STOP COSTLY CALLBACKS!

Install only APPROVED Standard TV replacement tuners. Non-approved tuners often *can not* be adapted to a particular set with satisfactory results. Each approved Standard tuner comes individually boxed, complete with circuit diagrams and installation data. Accept no substitutes!

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COIL PRODUCTS CO., INC.
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Export Agent: Rocke International Corporation, 13 E. 40th Street, New York City

Get set for bigger profits with Standard Coil's line of TV replacement tuners. Call your jobber today or write Standard Coil Products Co., Inc., 2085 North Hawthorne Avenue, Melrose Park, Illinois.

In TV it's Standard

SERVICE...The National Scene

SERVICE HAILED FOR CONTRIBUTIONS TO INDUSTRY--Applauding the hearty efforts of the nation's Service Men to keep 'em playing, the executive veep of a leading radio-television-electronic manufacturer, told a group of security analysists recently that the electronics industry would never have made the giant strides toward its present nine-billion dollar position, if buyers had not known that trained Service Men were available to keep their equipment in operating condition. . . . Service was described as an important facet of the nation's business structure. When properly organized, the management experts were told, service pays its own way; it's a good investment that returns its outlay manifold in many forms. . . . Reporting on the growth of service and its relation to industry sales, the v-p said that in '53, consumer service was responsible for 16.4 per cent of electronic gear sales; almost as much as the total sales of all electronic products to both consumers and government in '46. In '54, it was noted, a new high will be recorded by service and in '55 the bell will ring again. . . . Today, it was said, there are nearly 100,000 Service Men, active either as independents or employees, and most of them are involved in radio and TV service for the home. With the expected growth of the electronics industry, it is believed that more than 125,000 Service Men will be needed by '57. These revealing figures were cited as a measure of the importance of service to industry today and tomorrow.

NYC LICENSE BILL SCORED BY SET MAKERS; PRAISED BY ASSOCIATIONS IN HEARINGS--A measure to license Service Men, presented a year ago in the N. Y. City Council, reintroduced many months ago and then tabled in a committee session, was revitalized a few weeks ago, because of a probe into excess charges, ordered by the Mayor. . . . Declaring that city control would stabilize the repair business, the district attorney conducting the investigation said that licensing would comb out the disreputable operators and add respect to the service business. . . . Supervision, the d.a. added, would insure the orderly maintenance of records, disclosing, for instance, that parts used balance with inventory and purchases; thus the books would detail repair parts actually bought, installed, and billed to customer. It would be apparent if old parts were used, or no parts used or new, were involved, and featherbedding charges would be eliminated. . . . Association heads and members, who also defended the proposed legislation, said that the bill would prevent incompetents from practicing, and the thoroughness of an examination could readily control the degree of competency and technical standards one would have to meet.

IN REBUTTAL, RETMA's prexy said that the trade association holds that licensing would not solve the problem of incompetency or unscrupulous operations. . . . "We believe," he said, "that the TV service industry can serve the public honestly and efficiently, only if it is allowed to progress and prosper under the stimulus of free competition. Contrary to the belief that licensing will end a few magnified abuses, we believe it may multiply them in its protection of the inefficient and incompetent by restricting normal, healthy competition." . . . Adding that RETMA is not alone in its position against licensing, the association headman declared that retailers and others have expressed objections to artificial controls that could easily be an instrument turned against the best interest of the TV set owner and industry. The results of licensing, in their opinion, would be increased service cost, because of less competition coupled with licensing costs passed on to customers; lower standards of competency due to substandard exams designed to meet the existing skills of the majority; control of service, with arbitrary powers given to examining groups; protection of the unethical, since integrity cannot be guaranteed by a license; and reduced competition, because ingenuity and initiative would be discouraged by regulations which in effect would limit the number of newcomers in the service industry. . . . Most of the Councilmen, serving on a special committee studying the proposed ordinance, criticized the RETMA stand, declaring that the only persons who would be riled by a license would be those who could not toe the line.

SERVICE...The National Scene

INTERCEPTOR STATIONS CALLED IDEAL SOLUTION TO BLUFF AND REMOTE COVERAGE--The use of satellite stations to bring signals to those in areas now blocked by mountains, hills or other natural obstacles, or the cold wall of economics, accepted by many as a basic necessity, was described recently by a Commission spokesman, as the only practical approach to the problem. Reviewing the subject in the transactions journal of a broadcast engineering professional group, the government expert said that the economics of TV today are such that we probably will never have television stations in as many small towns as we have AM stations, because the cost of running a television station is from three to five times the cost of operating a similar standard broadcast station. In addition, the report added, it has been found that if all of the existing stations now operating served a 50-mile radius, there would be about 8,000 towns and cities in the nation beyond the 50-mile zone that would get either no service or poor service. To overcome these difficulties, it was noted, multiple transmitters can be used: The Commission has declared that it would waive any requirement for local programming and allow multiple programming over a number of transmitters. And, Washington feels that it should be possible to use any assignment in the allocation table with several transmitters to cover the same area, rather than a single large transmitter. Thus, said the FCC engineering representative, it now appears that we are at the place in the development of the television broadcast service where the application of the multiple transmitter idea is very appropriate.

MASS PRODUCTION OF TRANSISTORIZED SETS EXPECTED IN '55--A number of set manufacturers have revealed that they'll be on the production line next year with transistorized chassis. . . . Interest has been sparked by the significant success of one manufacturer, now marketing an all-transistor portable receiver. It has been reported that the initial production of these sets has been sold out, with more than 35,000 orders on the books. . . . Not only will small sets, using transistors, be made next year, but TV models featuring substantial quantities of the germanium crystals, are being readied for the belt circuit too. . . . The vigorous interest has spurred transistor production and plant expansion; moves which are expected to slice the prices of many types of transistors and increase mass usage of these pea-sized amplifiers, oscillators and detectors.

EXPERTS FORECAST 6.9-MILLION TV SET SALES IN '55--According to set and component makers, attending a recent RETMA meeting, 6.5-million b-w TV sets will be sold during the new year, and 300,000 color chassis will be installed, too. Color production sale guesstimates ranged from a low of 50,000 to a high of 750,000. Average estimates of radio sales were 6.9-million home models and 3.8-million auto sets.

COLOR-TV HOME PROJECTION ASSEMBLY DEMONSTRATED--A new type of color set, using a packaged folded-optical assembly to project, on a flat screen, color pictures somewhat larger than that of a 21-inch direct view tube, has been developed. Housed in a cabinet, no larger than an ordinary console set, the receiver uses three 2½-inch projection tubes, operating from a 25-kv power supply. The new approach was said to solve color purity and replacement problems. In the case of the three-gun tricolor tube, adjustment of the tube operating conditions must be such that the red gun excites only red phosphors, and so on. In the new approach, using projection tubes, the red electron gun is simply the tube which can produce only red light on the projected image, and thus no adjustment for color purity is required. Similarly, in replacement, only the failure of any one tube requires replacing just that tube, and not the entire picture-tube system, which in the direct-view setup is the tricolor tube. The dust-collection headache, which has prevailed in practically all projection systems, where particles pile up on the number of optical surfaces used in indirect displays, will not obtain in the new development, it was said, adequate protective means being used to prevent such collection. . . . Early next year, sample assemblies will be ready for set manufacturers and full production may be in swing in about a year from now. Original cost of projection sets were estimated as being in line with receivers using tricolor tubes of equivalent screen size.--L. W.

The One Big Reason Big-Screen Color TV Sets are on the Market Now

It took more than engineering promises before leading set manufacturers invested in production of color TV sets. It took a practical big-screen color picture tube . . . the CBS-Colortron "205."

It took *creative* engineering to conceive this advanced design in color picture tubes. And it took *advanced-engineering* knowledge to produce it.

Today, these set manufacturers are demonstrating their recognition of the leadership of CBS-Hytron. For they are shipping color TV sets *and these sets are equipped with the CBS-Colortron "205."*

There can be no better evidence of the *advanced-engineering* knowledge of CBS-Hytron . . . *Advanced-engineering* knowledge *you* can depend upon to produce the finest in television tubes . . . for color *or* for black and white.

CBS-Colortron "205"

205 SQUARE INCHES
OF PICTURE AREA

WRITE FOR **FREE** BULLETIN E-227 TODAY.
Four pages of engineering application data on the "205."

CBS-COLORTRON PATENT NO. 2,690,518. OTHER PATENTS PENDING

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by T. L. GILFORD

Electrostatic Focus Adjustments in Vertical TV Chassis . . . Auto Radio Hash and Motor-Noise Problems and Cures*...Bias Networks For 12BE6 Converters

If the antenna vacuum valve on Cadillac cars is allowed to touch the chassis (next to power transformer) hash will be heard from the speaker. Friction tape (applied between valve and chassis) or adhesive tape will eliminate this trouble.

Hash and motor noise can also be minimized by spacing the temperature compensating capacitor from ground (tuner frame) as far as possible. Another possible remedy would be to make sure that the green and blue leads be well separated from the yellow and gray leads; these are the leads coming from the coil assembly on the tuner.

To prevent *repeat* dial pointer breakage on '53 Cadillacs, a piece of rubber *electrician's* tape can be glued on to the tuner frame at the point where the dial pointer makes contact on the return sweep. The piece of rubber tape will help absorb some of the shock in the return sweep.**

12BE6 Converter Change

To increase the sensitivity of Westinghouse V-2236-1 chassis at the high-frequency end of the broadcast band, a bias network composed of a (R_8) 150-ohm resistor and (C_8) .002 mfd. capacitor has been added in the cathode circuit of the 12BE6 converter. The addition of this bias network has been found to produce equal oscillator injection voltage over the entire tuning range of the receiver. The new 12BE6 converter circuit is illustrated in Fig. 1.

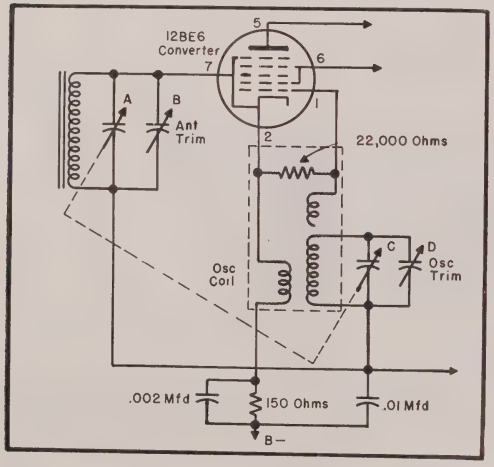


Fig. 1. Modified 12BE6 converter circuit in Westinghouse V-2236-1 chassis.

*From notes in *Delco Testing Tips*, submitted by *Earl Roberts*.

**Miracle adhesive (white) was found satisfactory for cementing the tape to the tuner frame.

‡From Magnavox service notes.

Focus Adjustment‡

All Magnavox 250 series chassis (vertical type) make use of electrostatic focus tubes in both 17" and 21" models. Most of these tubes were designed to have optimum focus with the focus electrode grounded. Others were designed to connect the focus anode to 500 volts.

In view of this situation, a terminal strip has been incorporated on the rear of Magnavox chassis with two pin jacks; one at ground potential and the other at 500 B+ boost voltage. Thus, if replacement of the picture tube ever becomes necessary, the focus electrode lead can be connected from the tube socket to the pin jack giving best focus.

Record Player Demonstration With TV Sets‡

If a record player used for demonstration with a television receiver is placed on top of the cabinet, mechanical feedback may result, causing distorted reproduction.

Portable Radio Dial Cord Slippage

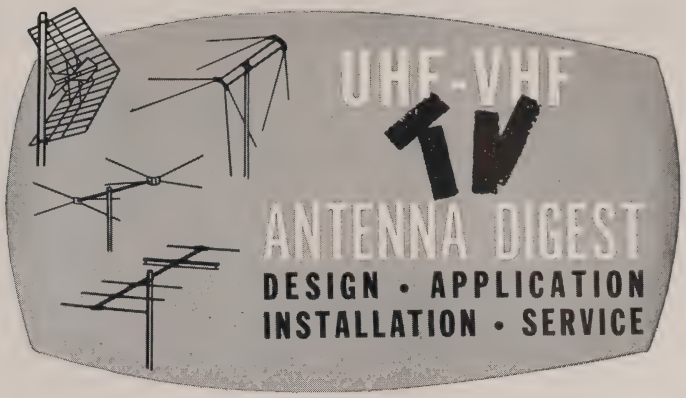
If on RCA 3-BX-671 and 3-BX-672 portables the tuning knob fails to move the dial pointer, it may be due to the dial cord slipping on its drive shaft. This condition could be caused by grease on the cord or on the *hour-glass* drive shaft. To remedy this condition, the tuning knob shaft *hour-glass* should be washed with carbon tet and the tuning drive cord replaced. It should not be necessary to replace the indicator cords. If this condition is not very severe, it may be possible to apply sufficient solvent to the drive shaft without removing the chassis from the cabinet.

Line Cord Abrasion Cure

Some of the RCA 2ES38 *Victrolas* have a metal bracket fastened from the bottom of the well for the 45 *rpm* centerpost to the changer mechanism. It is possible for this bracket to cause abrasion of the line cord resulting in a connection of one side of the *ac* line to the motorboard. This condition will be evident by a hum in the speaker.

Whenever this model with the metal bracket installed is encountered the bracket should be removed. Also, the *ac* line cord should be checked for adequate strain relief.

Antenna research laboratory recently set up by Ward Products Corp., in Ashtabula, Ohio, for the design and testing of TV and automotive antennas. According to W. H. Rickards, Ward director of engineering, test facilities include equipment for the measurement of impedance, vswr and gain. A pattern range has also been constructed in the lab.



Antenna Gain...Lab-Field Activities

Ranch wagon equipped with Unicorn antenna, telescoping mast, TV receiver and field strength meter, which test engineers have been using in the field to evaluate antenna efficiency. Unicorn is mounted on a stub mast, on top of the wagon, to show the effect of wind velocities up to 70 miles an hour. For reception, the antenna is mounted on a hinged mast providing an elevation of 25' above ground level. Erection time is about 5 minutes. (American Screen Products Co.)

A 150' aluminum TV tower that was installed recently in Valencia, Venezuela, S.A. Tower was assembled from 6' sections and raised with another section of aluminum tower 48' long acting as a boom. After the first 102' was raised with 48' boom and temporarily guyed, a small A frame was used to hoist the tower so that six-foot sections could be added from the bottom until the tower reached 150'. Tower weighs one pound per foot. Triangular aluminum tower is made in three different weights for various height installations: Economy tower weighing ¾ pound per foot is recommended for heights up to 90'; Standard tower which weighs 1 pound per foot is recommended for heights up to 120', and Commercial tower weighing 1½ pounds per foot is recommended for heights up to 150'. (Alprodco, Inc.)

GAIN FACTOR information can serve as a valuable measure of antenna efficiency, aiding one to select the most effective model or type for specific installations.

Too often though this important information either is not offered directly, but rather as a reference figure, or the db shown is just an approximate value and difficult to align with published radiation patterns. And then again, often only the horizontal radiation patterns are provided.

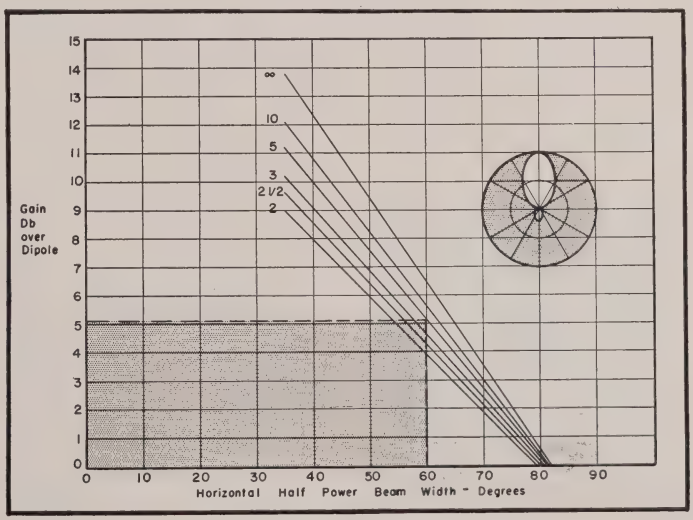
This problem, it has been found, can be solved with a set of gain curves which relate the gain of an antenna to its half-power beamwidth and front-to-back ratio, both obtainable from a horizontal radiation pattern.

The curves shown in Fig. 1, have been found to be useful for common antennas such as folded dipoles, inlines, dipoles and screens, conicals, yagis, and for most antennas not extending more than three quarter-wavelength horizontally in the direction perpendicular to the maximum of the radiation pattern.

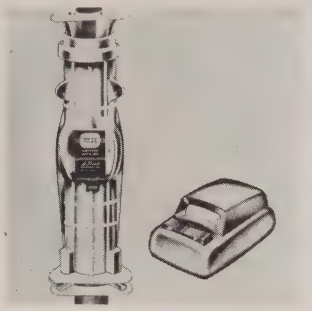
The gain noted is for a single unit. Field checks have shown that this factor is increased by not more than three db when stacking.

From a report prepared by **Ansel J. Gere, research engineer, Gabriel Labs, research facility for Gabriel Electronics and Ward Products Divisions of the Gabriel Co.*

Fig. 1. Plot showing expected antenna gain, as a function of the horizontal half-power beamwidth and front-to-back ratio. Typical example, in pattern at right, is for an antenna with a horizontal half-power beamwidth of 60° and front- to back-ratio of 5, producing gain of 5.10 db: Shaded area at left shows how gain information was obtained. (Prepared by Ansel Gere, Gabriel Labs.)

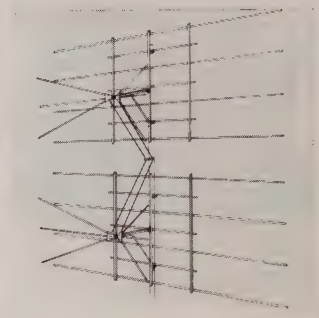


Review of UHF / VHF Antennas-Accessories



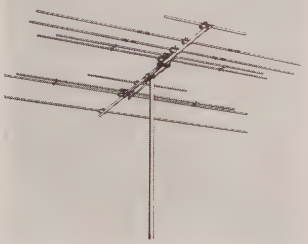
In-line rotator with balanced mount. Has reinforced 1/8" gear teeth with protective shroud to prevent stripping of gear teeth. Also includes four pole capacitor type motor with Oilite bearings, and large vertical and horizontal thrust bearings. Will support four stacked arrays. Built-in brake prevents creeping. Chuck-like clamps have serrated tooth design said to provide positive grip of mast. Clamps are reinforced with web trussing to prevent spreading. Single retaining ring at top and double rings at bottom permanently support mast in position. Console has fingertip action control which operates with downward pressure. Full vision dial. (Vee-D-X model VB; LaPointe Electronics, Inc.)

Coax cable line-tap providing isolation and attenuation. Designed for use in master antenna systems permitting taps anywhere along coax transmission line, either indoors or outdoors. In application one files a half-round notch into the coax line until center conductor shows. Unit is then placed in position on coax cable and clamped in place by two machine screws. Finally, a pointed screw is tightened to make ground connection with coax shield. Standard coax fitting with built-up resistance provides connection to tap line. (Model 1599 Automatic Line Tap; Technical Appliance Corp., Sherburne, N. Y.)

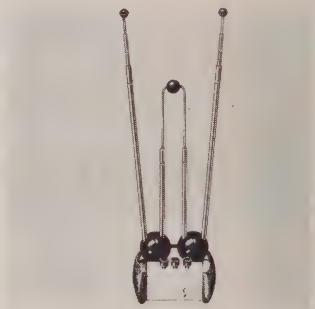


Conical-V-Beam screen array, designed around a single-bay unit, elaborated into a two-bay structure, by addition of specially designed stacking transformers. Model is produced under patent 23,346. The screen reflectors are dimensioned to provide in-line, single lobed directional pattern in both horizontal and vertical planes, at all frequencies. Features all-aluminum conquencies. Features all-aluminum construction. (King Pin model 201 (single bay) and 202 (two-bay stacked); Telvex, Inc., Asbury Park, N. J.)

Rectangular reflecting screen and bow-tie indoor dipole, developed for vhf/uhf, which was cited for its design in recent Hess Brothers contest ceremonies in N. Y. City. (Wonder Bow; Channel Master, Ellenville, N. Y.)



Antenna with a patent-applied-for phasing method (Miracle Phase), said to isolate undesirable interaction and loading of phased elements. Phase inverting element is claimed to permit low-band dipole to function with proper gain and pattern response in high band. (Sabre Senior; Welco Manufacturing Co., 225 S. Third St., Burlington, Iowa.)

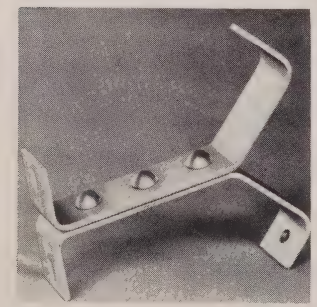


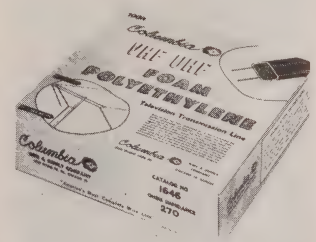
Indoor push-button antenna for uhf, vhf and FM. Stands 17" high when collapsed, and sits on 4½" base. Comprised of two 3-section staffs jutting out of both sides of the base and one dual phasing bar in center which can be raised or lowered. Staffs can be extended to 41". (Model 5D Directronic 8-Position Push Button; Synder Manufacturing Co., Philadelphia, Pa.)

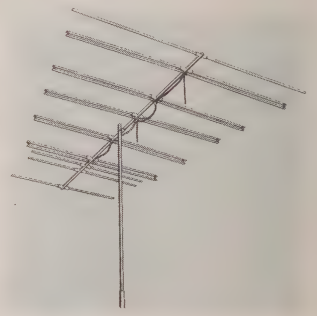
Galvanized steel Y mount featuring assembly of three solid rivets. (Parker Metal Goods Co., 161 Summer St., Worcester, Mass.)

Packaged 100' uhf/vhf foam polyethylene transmission line. (Columbia Wire and Supply Co., 2850 Irving Park Road, Chicago 18, Ill.)

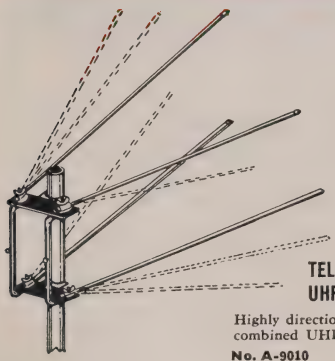
Antenna designed to reject unwanted signals from sides or rear; claimed to provide up to a 100-1 ratio on all bands. (Rear-Guard; Kay-Townes Antenna Co., 1511 Dean St., Rome, Ga.)







THE "TELCO TEN"



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TELCO "DOUBLE V" UHF-VHF ANTENNA

Highly directional...adjustable for combined UHF-VHF 50°-70°-90°.

No. A-9010 **List $5.95**

...the "T" formation line—T for Top Quality and T for Ten Antenna Styles. Insist on TELCO

...the best TV antennas for the greatest "show" on earth.

TELCO G·C

WISHBONE

...exclusive with TELCO, is a free air insulator that prevents shorting out under any condition . . . found only on TELCO UHF Antennas.

FREE CATALOG—illustrates all TELCO products. Available at your jobber or write direct today!

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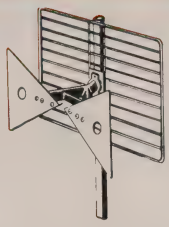
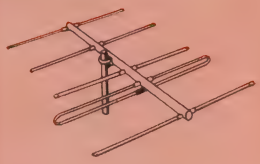
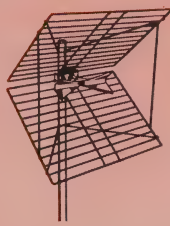


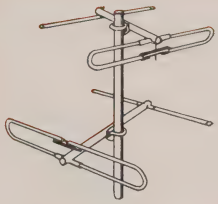
TELCO UHF "GOLDEN GRID" SUPER DELUXE BUTTERFLY ANTENNA
No. A-8965 **List $4.95**



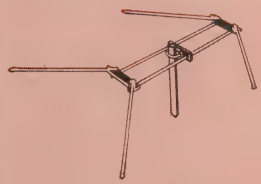
TELCO VHF 5 ELEMENT YAGI ANTENNA
Custom Cut for Each Channel
No. A-302 Channel 2 List $12.25
(Available for channels 3 - 13 = A-303 - A-313 $7.25 and up)



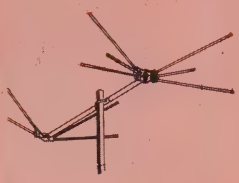
TELCO UHF "GOLDEN GRID" DELUXE CORNER REFLECTOR ANTENNA
No. A-8984 **List $8.95**



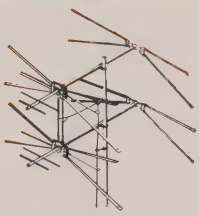
TELCO VHF HI-LOW DIPOLE ANTENNA
No. A-250 **List $7.35**



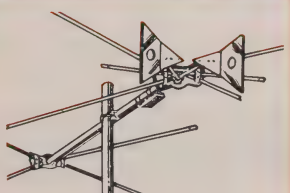
TELCO VHF-UHF FLYING V ANTENNA
No. A-260 Single Bay List $4.75
No. A-262 Two Bay 10.25



TELCO VHF CONICAL ANTENNA
No. A-8700 **List $7.00**



TELCO VHF SUPER COLOR CONICAL ANTENNA
No. A-230 **List $7.85**



TELCO UHF-VHF UNIVERSAL CONICAL ANTENNA
No. A-8981 **List $8.95**

TELCO UHF-VHF "GOLDEN HALO" INDOOR ANTENNA
No. A-9000 **List $3.95**

The Only TV Tower

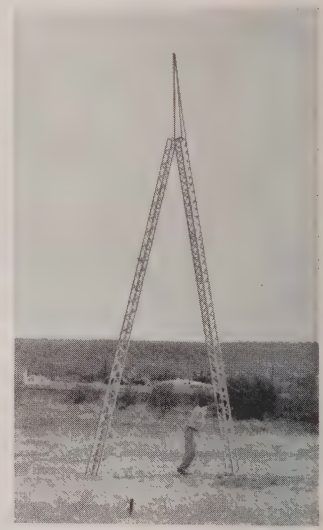
ALPRODCO'S POP-UP TOWERS

THE ANSWER! YOU BET! For the first time since **TV** started, we have a tower that solves all the problems! It comes in a package! It is pre-assembled! One man can erect it easily! Install antenna and rotator on the ground! Raise and lower it in seconds! It is guaranteed! And look at the low, low cost. Yes, **POP-UP** is the answer!

POP-UP's CONSTRUCTION: It is a beautiful combination of Alprodco's famous aluminum and steel towers. The lower section is Alprodco's triangular hot-dip galvanized steel and the top section is Aircraft Aluminum joined at the "elbow" with a strong A-frame. You get the whole "Ball-o-wax" including 1. hinged base, 2. ground anchors, 3. Aluminum and steel towers, 4. winch, 5. cable, 6. A-frame, 7. guy-brackets, 8. top-trim, 9. mast kit, ***and*** 10. a 9 foot telescoping aluminum mast.

1. POP-UP TOWER package—neat, compact and delivered without damage. Lay the tower out on location, bolt the sections together and it's ready to **POP-UP.**

2. ASSEMBLED: Use temporary guys at right angle to the raising position and **POP-UP** can be pushed up by one man. The top aluminum tower serves as a "reverse" boom.



3. PUSH POP-UP up. Pick the tower up at the "A"-frame "Elbow" and work back on the top half as the tower jack-knifes up. While the tower is in this position, secure the third guy and then plumb the lower tower.

WORLD'S LARGEST PRODUCER OF ALUMINUM TV, AM AND FM TOWERS

ALPRODCO, INC.
ELECTRONICS DIVISION

TOWERS • ANTENNAS

MINERAL WELLS, TEXAS

One Man Can Erect!

PRE-ASSEMBLED POP-UP TOWERS are delivered with all parts assembled. Bolt the sections together and it's ready to POP-UP.

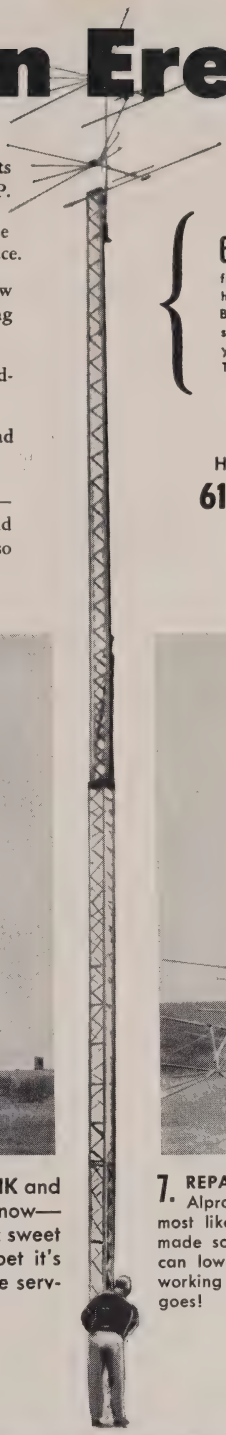
SAVES STORAGE SPACE. The aluminum tower is nested inside the lower steel tower and requires less than half the usual storage space.

COMPLETE INSTRUCTIONS with each tower. Simple, easy to follow instructions guide correct **ASSEMBLY, ERECTION,** guying, installing antenna, lead wire and any make rotator.

Alprodco **PAYS COST OF SHIPPING** right to your door. No hidden costs when you get 5 or more **POP-UP** Towers.

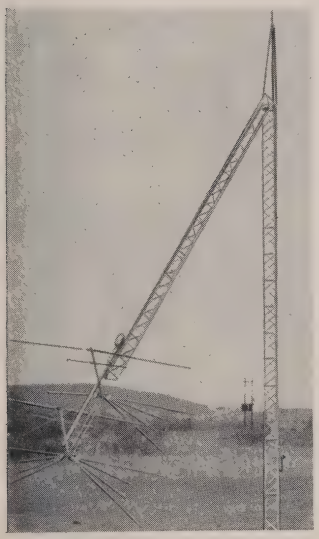
GUARANTEED to withstand up to 90 mile wind and storm load when guyed according to factory recommendations.

POP-UP'S DEALER PRICE: 49 ft.—$53.25; 61 ft.—$64.45; 73 ft.—$75.65. Full freight paid on 5 or more towers assorted. (The demand for this new tower has swamped our production department—so please allow as much lead time as possible on delivery.)

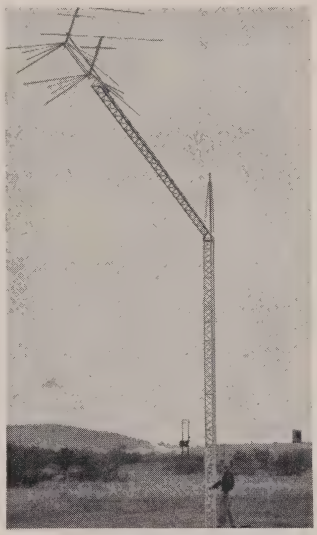


6. POP-UP is UP. Fasten the top guys and walk away from the easiest tower job you've had yet! And boy, isn't she a B-E-A-U-T-Y? Let winds and storm blow... no worries when you use Alprodco's POP-UP Tower.

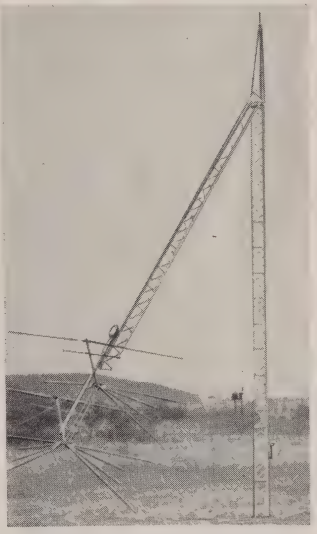
HEIGHT
61 feet



4. Attach an **ALPRODCO ROTATOR** if available, and an **ALPRODCO ANTENNA,** and it's all ready to go up. Pull the antenna away from the tower base to get winch leverage and crank.



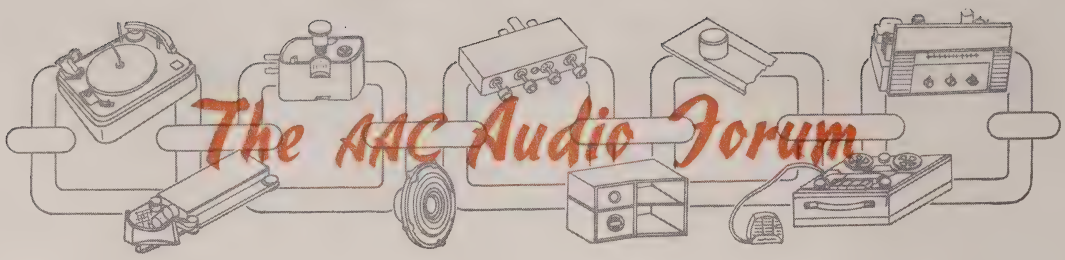
5. JUST TURN THE CRANK and up she goes! Honest now—have you ever seen such a sweet deal! The Answer! You bet it's the answer! **POP-UP** is the service man's dream!



7. REPAIRS? If you haven't used an Alprodco Antenna and rotator, most likely there are repairs to be made soon. So—in 10 seconds you can lower the antenna to a handy working position. All done? Up she goes!

ROTATORS • SLIP-UP MASTS

KEMPTON, INDIANA • DUBLIN, GEORGIA



Part V of a Series of System-Component Evaluation and Progress Reports†

The Service Man and Phono Repairs

by G. A. Morrell, Jr.*

Radio and TV Service Men are being confronted more and more frequently with phono and phono combinations which require service.

Phono pickups are simply electromechanical transducers or converters. They take the mechanical energy furnished by the rotating record and convert it to electrical energy suitable for amplification and reproduction by the speaker. In the main, their principle of operation may be piezoelectric, magnetic, variable resistance, or variable capacitance. Most common are the piezoelectric pickups, and the two types most often encountered are both of the piezoelectric type. They may have either a rochelle salt crystal element or a piezoelectric ceramic element. In these pickups the vibrations imparted to the needle by the record groove are converted into useful output voltage by a tiny element of crystalline material. Magnetic type pickups utilize the principles of electromagnetic generation to develop a useful output voltage.

When we refer to a phono pickup we have in mind the compete assembly of the tone arm and the cartridge with its needle. Nearly all modern pickup cartridges are purposely made removable from the tone arm. In addition they are provided with quick disconnect type terminals which make possible ready replacement of the cartridge without soldering. Some cartridges have matched needles which are designed to work with the given cartridge, whereas other cartridges have a thumb screw or small set screw and can be used with standard types of needles.

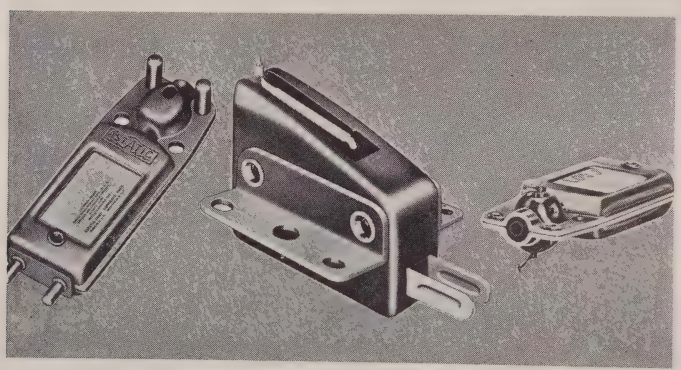
The principal performance characteristics of any pickup are output voltage, frequency response and needle compliance. Output voltages of rochelle salt crystal pickups range from about ½ volt to about 5 volts, depending on the type. The ceramic types range from about ½ volt to 1 volt. Magnetic pickups are quite low in output, about 10 to 50 millivolts, and require additional amplification and considerable equalization or compensation in the amplifier to obtain correct frequency response. The crystal and ceramic types require little or no compensation.

Frequency response characteristics of pickups vary according to the type. Some for example have a frequency range of 50 to 4,000 cps; others may have a range from 30 to 10,000 cps. Furthermore, the shape of the frequency response curve may vary among different types. There has been a recent trend toward wide range and smooth response for the newer phonos with improved tone quality.

Needle compliance is usually indicated by the specification of needle pressure or needle force. The higher the compliance the lower the needle pressure at which the pickup will perform satisfactorily. There has been a trend toward lower needle pressures in modern pickups; this has been found to result in longer needle and record life.

The manufacturer of a phono devotes considerable effort to the design of his product. A complete phono or phono combination is in reality a *performance package* containing the pickup, turntable, amplifier and speaker, all of which are enclosed or mounted in some sort of cabinet. All of these items are carefully selected by the manufacturer to obtain the desired overall performance and tone quality. The constant demand for improved performance and lower cost in phono has stimulated the development of new

(*Continued on page 39*)



Three types of piezoelectric cartridges using rochelle salt crystal and ceramic elements. (Courtesy Astatic)

*Chief Engineer, Acoustics Division, **The Astatic Corp.***

† Presented as a service to industry, in cooperation with the Audio Activities Committee (through its Promotion and Public Relations Subcommittee) of the Sales Managers' Club, Eastern Division, who have arranged for members of the audio industry to contribute authoritative data on all phases of audio in which they are most expert. Comprehensive reports feature technical and merchandising information on amplifiers, preamps, speaker enclosures, speakers, turntables, record changers, cartridges, needles, arms and accessories, recording discs and tapes and accessories, tape recorders, special output transformer kits and tuners.

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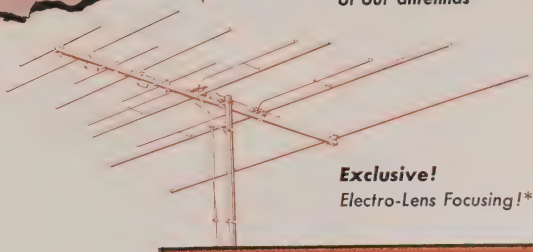

A great new antenna that gives you both

1. Complete all-channel VHF coverage—
2. Brilliant yagi performance—
   Yes, the extraordinary high gain of a yagi . . .
   The pin-point directivity of a yagi . . .
   Not on just one channel—not on just one band
   —but clear across the whole VHF spectrum.

The Interceptor is designed *for both black and white and color*

The same Interceptor that gives you those sharp, clear black and white pictures today will give you the truest, brightest color pictures imaginable in the future.

NOTE—The Interceptor has been received so enthusiastically . . . all over the country . . . that the Winegard Company, even with around the clock production in its brand new plant, can't seem to make *Interceptors* fast enough. Twice this season production has been actually doubled over what was originally planned, and still we are experiencing difficulty in keeping up with this tremendous demand. So, get your order in now and avoid disappointment on delivery.

List price U.S.A. . . . Interceptor . . . per bay . . . $24.95
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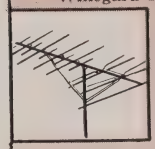
Exclusive!
*Electro-Lens Focusing!**

AND NOW up to 22% more gain! Super 'Ceptor
(Super Interceptor)

A NEW more powerful version of our famous Winegard Interceptor—Now—makes it possible to have multi-element yagi performance on all channels in the most extreme fringe areas.



The Super 'Ceptor possesses all of the wonderful features of the Interceptor, but with much increased sensitivity . . . up to 22% more gain over the standard Interceptor model.

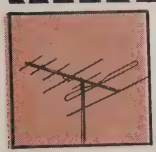
Features of the Interceptor and Super 'Ceptor

- Excellent 300 ohm impedance match over the entire VHF range.
- Extremely narrow yagi type forward lobes, with no side lobes and negligible rear lobes.
- Single lead . . . no switching . . . no interaction between the high channel elements and the low band elements.

The New Winegard Super 'Ceptor
(Super Interceptor)
With Electro-Lens Focusing!*

Gives you—multi-element yagi performance, not on one channel . . . not on one band . . . but on every single channel in the whole VHF spectrum!

List price U.S.A. . . . Super 'Ceptor . . . per bay $34.95
(Stacking bars available)



IMP—Model L-7 for channels 7–13. On the high VHF band, the IMP functions as two high gain yagi—operating side by side in perfect phase, to give gain and directivity far in excess of more conventional 7–13 broad band designs.

Imp Features:

- Exceptionally high gain on channels 7–13.
- Full wave driven elements.
- Full wave reflector elements.
- Electro-Lens Focusing.*

Note—the IMP makes the perfect all-channel attic antenna for *all* channels in primary areas.

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THE PIXIE

Top all channel performance—at a low price—featuring unique improved conical type driven element—for high gain and uni-lobe directivity.

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BETTER AUDIO From Old Radio-TV-Phono Chassis

by SOL HELLER

BEFORE INSTALLING a loudness control, one must be sure that the audio system in which it is to be used has sufficient gain. To make such a test, the setting on the set's volume control should be reduced, to a point where the resistance measured from the low side of the pot to its center terminal equals the total resistance of the potentiometer multiplied by .011. Then the set can be turned on; if the volume is not adequate (if the set cannot be comfortably heard in all parts of the room) the loudness control should not be added, unless an extra stage of amplification is built into the set.

When the volume control present in the receiver is a dual or triple section type, the loudness control will substitute only for that section that acts as the volume control. A special kit is available for such situations.

Demonstration Unit

A demonstrator setup that can be attached to a shop radio and used to impress potential customers is shown in Fig. 1. By moving the *dpdt* switch to one setting, reception will be heard with the set's conventional pot; at the other switch setting, the improved reception (at low volume) with the loudness control in the circuit becomes evident.

A major improvement can in many cases also be effected by replacing a small or otherwise inadequate loudspeaker. Many otherwise high-quality TV sets have 5″ *pm* speakers, some of which are oval in type; substitution of a good 8″ or larger unit will improve tone quality considerably.

If the (console) cabinet is still in fine shape, it should also be possible to interest the set owner in a separate speaker enclosure, as well as a new speaker. Such an addition, properly installed, can provide a very substantial improvement in sound reproduction.

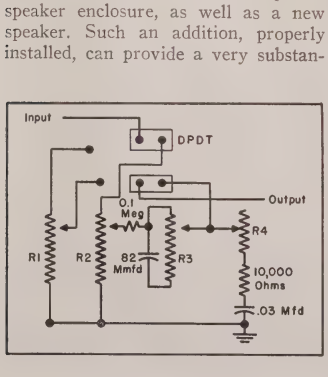

Fig. 1 (left). Readily-assembled unit for demonstrating loudness control. Input lead goes to circuit point to which hot side of receiver's volume control originally connected; the output lead goes to the point where the center tap originally went. (Courtesy IRC)

The need for an enclosure becomes apparent when we consider the following performance criteria.

The forward motion of the speaker's cone causes a compression of air in front of it to take place, at the same time that a corresponding rarefaction of air is going on behind it. When no baffle is present, the two opposite-going waves can and do cancel each other to a certain extent, particularly at low frequencies. This action not only reduces volume, but introduces distortion as well.

The simplest way of minimizing such an effect is by using a flat baffle. When the baffle is wide enough, and tall enough. with respect to the wavelength of the lowest audio frequency to be reproduced, it will substantially reduce this undesired cancellation of sound energy.

The conventional console-type radio or radio-phono combination uses an open-back cabinet. This is essentially a flat baffle whose sides have been folded back to save space. Both the front and the sides of the cabinet provide baffling. While the baffling present is quite an improvement over that of a table-model radio, it is still very inadequate, since low-frequency sound waves can and do get around the inadequate baffling and cancel.

Furthermore, the cabinet tends to resonate at a low frequency that is generally near the resonant point of the speaker itself. The resultant peak in the audio response produces at least two undesired effects: Booming tone, characteristic of sound reproduced by the equipment; and bass notes in the vicinity of the cabinet's resonant frequency which tend to set the cabinet oscillating, with the result that different bass frequencies in the original sound appear as one and the same frequency (the cabinet and speaker's joint resonant frequency) in the reproduced sound.

Distinctions between different instruments will be masked at low frequencies by this *false bass* effect. The deeper the cabinet, the more pronounced the effect will be. When the depth and width of the cabinet are equal, an undesired boost of 10 db may be given to audio signals at the resonant point of the speaker-cabinet setup.

These facts may be exploited service-wise, when a fairly good chassis is being used in a well-styled but acoustically undesirable cabinet.

The problem of what kind of baffle or enclosure to use will not be a thorny one. The bass-reflex type represents a practical solution to most situations.

A fine baffle is provided by a wall between two rooms. Mounting the speaker in such a wall, with the front and back of the speaker facing different rooms, will be found to reduce the resonant frequency of the speaker-baffle combination to a point where good bass reproduction becomes possible. (Frequencies below this resonance point are not faithfully reproduced; the lower the speaker and baffle's resonant frequency, the better will be the system's low-frequency response.)

Such an installation is. of course, practical chiefly in basements and attics, where thin wooden walls are present and *looks* do not represent a

(*Continued on page* 38)

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ONLY $75 LIST

MAKE *Every* P.A. A HI-FI INSTALLATION WITH THE *New* MODEL BLC

FULL RANGE WEATHERPROOF COAXIAL SPEAKER

SPECIFICATIONS

Response	70-15,000 cps
Power Capacity	25 watts
Impedance	8 ohms
Dispersion	120 degrees
Mounting	180° adjustable "U" bkt.
Dimensions	22½" diameter, 9" depth

Ask your distributor for a convincing demonstration, and HEAR THE DIFFERENCE!

More Efficient: DUAL RANGE THEATER TYPE SYSTEM permits uncompromising design of the "woofer" and "tweeter" sections for greatest efficiency. Hear it penetrate noise with remarkable fidelity and intelligibility.

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Better Lows: BALANCED "COMPRESSION" TYPE FOLDED HORN, starting with eight inch throat and energized by top quality low frequency "woofer" driver provides *more* lows than other bulky designs.

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Better Highs: DRIVER UNIT TWEETER with exclusive patented "reciprocating flares" wide angle horn transmits more highs with greater uniformity . . . high frequency response that you can *hear!*

More Dependable: EXPERIENCED MECHANICAL ENGINEERING AND CAREFUL ELECTRICAL DESIGN meet the challenge of diversified application and environmental hazards. Rugged, and conservatively rated—you can *rely* on the BLC.

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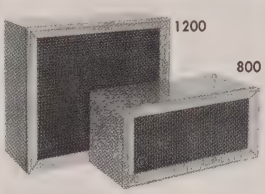
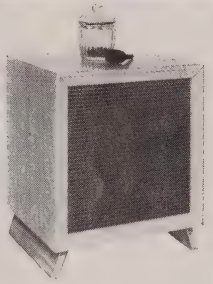
HI-FI SPEAKER ENCLOSURES



HUMMINGBIRD — Model 800 for 8" speaker; 1200 for 12" speaker. Compact without loss of performance . . . excellent tonal fidelity.



SKYLARK — Model 1512 — Impressive beauty and superb audio performance are combined in this hi-fi speaker enclosure. Takes 12" or 15" speaker (has removable baffles). 22⅞" high x 19¼" wide x 16" deep.

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Better Audio

(*Continued from page 36*)

problem. Hardware that permits this kind of mounting is commercially available.

When the set's speaker is not too good and the economics of the situation permits, a new speaker as well as an enclosure should be suggested.

The Service Man who plans to do modernization work should provide himself with a few good speakers and baffles that can be used on various jobs. The units chosen should be those that have been found, both by *spec* inspection and listening tests, to be best. A high-quality output transformer might be mounted into one of the enclosures, and a test jack and switch setup included to permit a ready substitution of the speaker and enclosure, with and without the output transformer.

When the customer has a satisfactory record-player and amplifier, a wide-range speaker may be suggested. Less expensive speakers, suited to the limited response of the equipment owned by the customer, may also be recommended. When an AM radio alone is present, the speaker's response need not extend beyond 5,000 cps.

Output Transformer Replacement

Replacement of the output transformer may be necessary or desirable. Much of the distortion introduced by less expensive amplifiers is often caused by this component. A good output transformer requires a high total inductance and low leakage inductance; two characteristics that can't be simultaneously achieved in an inexpensive unit, since the higher the total inductance. the higher the leakage inductance tends to become. A special interwinding construction is necessary to keep leakage inductance down. Such a construction will be found only in more expensive units.

A transformer offering a satisfactory response (20-20,000 cps . . . flat to within +1 db) may be obtained for a moderate price. The transformer chosen should, of course, be matched to the speaker and power amplifier used, and should have a wattage rating equal to that of the amplifier.

If a set owner balks at the expense of a speaker-enclosure setup, it can be pointed out that he is, effectively, laying the foundation for a *hi-fi* system that can be improved or added to as time goes on. It would certainly cost him more to buy a completely new setup, and getting started on the installment plan, as it were, is a relatively painless way of entering *hi-fi's* green pastures.

"Since I got this Hi-Fi rig with a JENSEN NEEDLE, business is jumping."

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Audio Forum

(*Continued from page* 34)

and different types of pickups having various performance characteristics, each of which is particularly suited to a certain phono application.

The diagnosis of pickup trouble in phonos is relatively simple. A quite common cause of complaints on phonos is a worn or damaged needle. As cited earlier in this forum, phono needles do wear out, contrary to some opinions. The wearing out is a gradual process. As the amount of needle wear increases, reproduction gradually becomes more distorted, especially on loud passages of music in the grooves close to the center of the record. Extreme needle wear results in complete failure of the needle to engage the record groove. A needle with a badly worn or fractured tip can ruin a good record in one playing.

Defective Pickup Diagnosis

A diagnosis of a defective pickup cartridge is best confirmed by replacing it with a new one of the correct type. The Service Man who has a considerable amount of phono repair work may find it convenient to have a turntable equipped with one or two types of pickups to be used for quick substitution tests.

The large number of cartridge models in use today presents a problem to the Service Man. Naturally, the conscientious Service Man wishes to make a repair which is satisfactory to the customer. He wishes also to make the repair as quickly as possible and make a fair profit on the job. The only way he can be sure of meeting these objectives is to choose carefully the correct replacement cartridge or needle, or both.

Replacement Precautions

Before a replacement is selected, it is wise to consult a replacement directory. In addition, one should also study the output voltage, frequency response, needle pressure and physical form of the cartridge to be replaced. These data are usually included in pickup catalogs. One should also make certain that the replacement cartridge selected is the one which most closely matches the original with respect to performance and physical form.

There are a few pitfalls to watch for in pickup cartridge replacement. For example, if the replacement cartridge is considerably lower in output voltage than the original, the phono may deliver low volume. If the replacement is too high in output voltage, acoustical feedback, howling or

(*Continued on page* 40)

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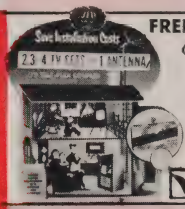

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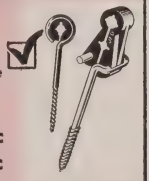

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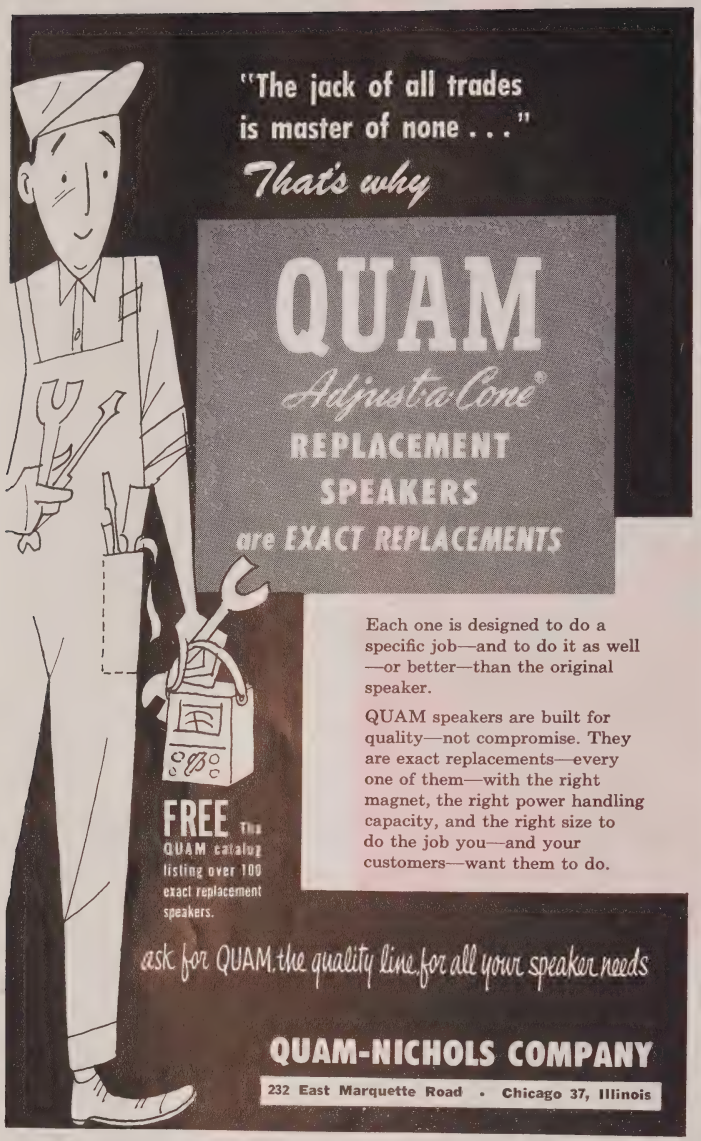
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Audio Forum

(*Continued from page* 39)

motorboating may be encountered. This is extremely difficult to correct and should be carefully avoided. A poorly selected replacement cartridge may cause poor tone quality if its frequency response differs radically from that of the original cartridge. Replacement cartridges which differ widely from the original in weight of the cartridge or in recommended needle pressure may result in faulty tracking of the records or faulty operation of automatic record changers. Evidence of these conditions will be excessive record wear, repeated playing of one record groove, failure of the record changer to trip at the end of the record and excessive needle and record wear. Some of these conditions can, of course, be corrected by proper adjustment of the tone arm or the amplifier circuit. However, this may be time-consuming for the Service Man who is not fully acquainted with phono design, resulting in a dissatisfied customer and an unprofitable repair job.

Matching Techniques For Audio Amplifiers With Power Output

by John H. Guenther*

APART FROM the problem of matching input sources (microphones, phono pickups, tape recorders, radios, etc.), and output loads (speakers, cutting heads, etc.), there exists the problem of matching amplifier components to each other. This matching requirement does not exist, of course, when using single chassis *pa* amplifiers as a complete system. In systems where more than one amplifier is used, this problem can become very serious.

The first aspect of the problem, impedance matching, is relatively easy to solve if a few fundamentals are observed. First, most power amplifiers require practically no power to drive them, a voltage source being the main necessity; and second, and conversely, the preamp or line amplifier is not required to deliver power, but must supply the required voltage. A low-impedance generator operating into a high-impedance load will fulfill both of the foregoing requirements. This is generally the case, as most preamps and line amplifiers have either a cathode follower or a transformer output, either of which represents a low impedance for supplying voltages; also most line and power amplifiers are built with a high impedance input which requires only a voltage for drive.

Matched Impedance Results

One might say that if the output and input impedances of the two amplifiers don't match the results will not be correct. Actually the only result of matched impedances will be maximum power transfer, but as stated, power as such, is not what is needed. For that matter, if the impedances were matched, only one amplifier could be driven by another. With unmatched impedances, any number of high-impedance input amplifiers can be driven by one low-impedance output amplifier up to the point where the parallel high impedances equal the low impedance. Thus, an impedance match is the limiting factor when connecting amplifiers together and not the controlling factor.

A much more important aspect of the problem of matching amplifiers is

**Design Engineer, Stromberg-Carlson Company.*

the matter of relative gain settings. The wrong settings of the controls can decrease the signal-to-noise ratio, increase the distortion, and thus ruin the performance of an otherwise good system.

There are two conflicting requirements which must be met to obtain the optimum operating characteristics of a series of amplifiers:

(1)—The signal output from every single amplifier in the whole chain should be far enough above the internal noise generated by the amplifier to obtain maximum signal-to-noise ratio.

(2)—The signal output from every amplifier in the chain should be sufficiently below the overload point to obtain minimum distortion.

It must be remembered that although a low-gain power amplifier may have a 90-db signal-to-noise ratio, the signal-to-noise ratio of a complete system, operating from a low-level microphone, may run only 40 to 50 db, due to the limitations imposed on the input of a high-gain preamp by thermal activity. A chain is only as strong as its weakest link and an amplifier system is only as quiet as its noisiest component.

Before any adjustments are made, it is necessary to know the relative position of the volume control in each amplifier circuit. If the control is at the input, it will have the same effect as varying the external input signal. That is, reducing the control will reduce the generated distortion, but will have no effect on the generated noise. Thus, the signal-to-noise ratio will be reduced. Most power amplifiers are built in this manner, as their absolute noise level is so low that it can usually be neglected, but often, high-input signals are encountered which may overload the first stage and cause distortion, if the signal is not attenuated at the input. If the gain control is at the output, it will have no effect on the generated distortion and will reduce the signal and noise together, thus having no effect on the signal-to-noise ratio. For this reason, very few amplifiers are built with the volume control in the output. A control near the center of the amplifier will have an effect on both the generated noise and distortion, because usually distortion is generated in the output stages and noise in the input stages. Most preamps are built in this manner, as the normal range of input signals will not overload the first stage and most of the noise problems are generated in the first stage of the preamp. One may find line amplifiers built either way, depending on the

(Continued on page 42)

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‡*Dual-Weight Cartridge. Has weight slug secured by shrink-on band. With lead weight, net weight of cartridge is 25 grams. If 12 gram weight is desired, the shrink-on band can be cut off and the lead weight removed. In addition Model W78 has capacitor, furnished as accessory. Without capacitor output is 4.0 volts; with capacitor output is 2.0 volts.*

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4 CROSS-REFERENCE INDEX—gives you the right Walco Needle Number to replace *any* replacement needle.

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Audio Forum

(*Continued from page* 41)

relative levels for which they were designed.

With these facts in mind, it is now possible to arrive at a compromise setting of the amplifier volume controls to achieve optimum performance from the over-all system.

The *operating* control must, of course, be set so that one can compensate for variations, both up and down from normal signal level. These variations are indefinite, but a normal control setting of from two-thirds to three-quarters of full-on should take care of most program material. The operating control is generally the preamp volume control, but in some elaborate systems it will be a separate control located in the output circuit from the preamp.

The volume control on the line amplifier is quite frequently used as a master volume control, and, in fact, a line amplifier is generally only necessary when more than two preamps are used, as the line gain is required only to overcome the losses resulting from the mixing of the preamp output signal. When used as a master volume control, the line amplifier control should also be set at about three-quarters of full-on. In this case, it may be necessary to provide different amounts of mixing loss from the various input sources, so that all signals reach the line amplifier at approximately the same level. This level should be low enough so as not to overload the line amplifier.

The control on the power amplifier is almost never used as an operating control and is only provided for flexibility. This control is set so that normal line level will provide the required power output, even if this means setting the control at a very low setting.

As a specific example, let us consider a system composed of six preamps* mixed into a line amplifier,† used as a master control, feeding a +8 dbm line level to a power amplifier.‡ What are the optimum settings of all the controls? The volume controls on

(*Continued on page* 44)

*Stromberg-Carlson AV-52. †S-C AV-53. ‡S-C AP-54.

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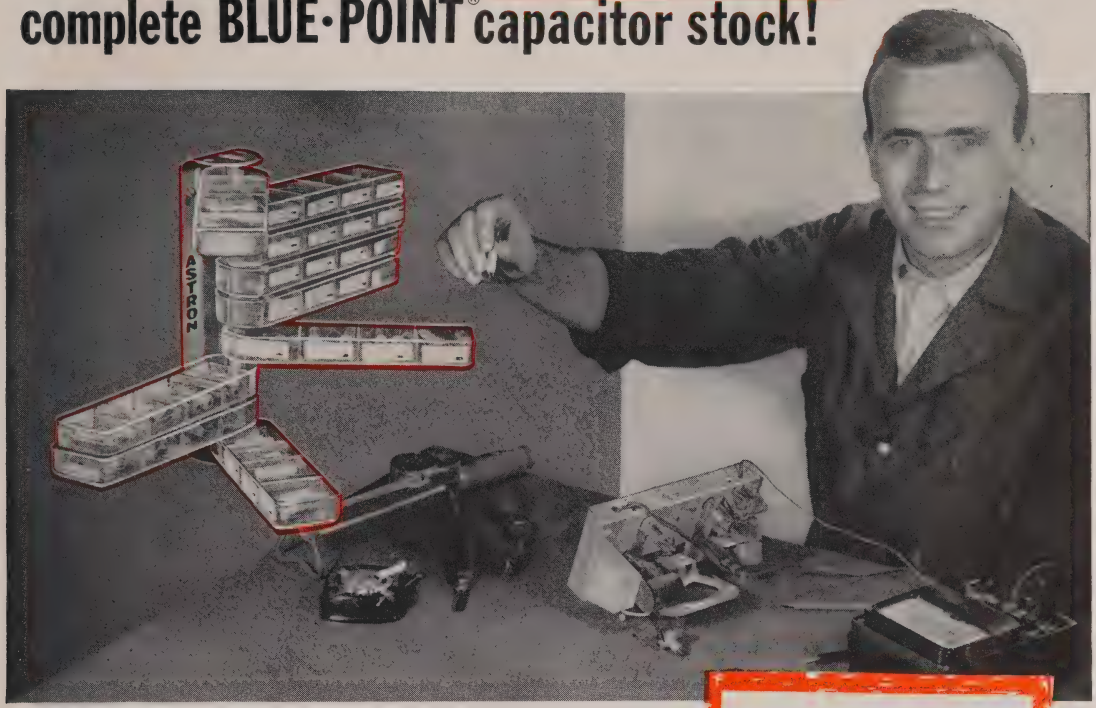

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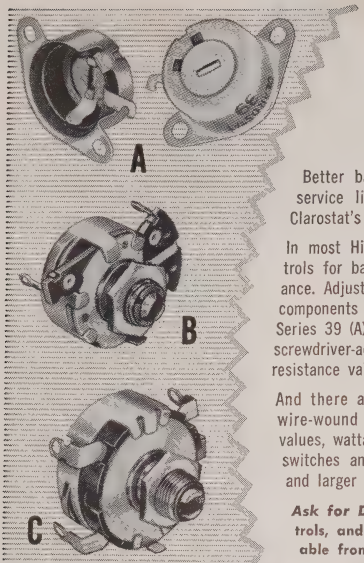

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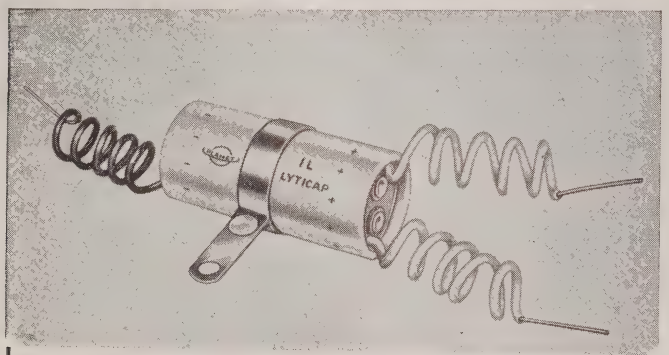

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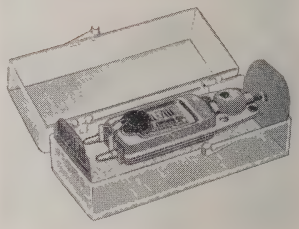
Audio Forum

(*Continued from page 42*)

the preamps should be set about two-thirds on, giving a gain reduction of about 12 db. The resulting gain of the preamps will then be 58 db. The volume control on the line amplifier should also be set at the 12-db reduction point giving a bridging gain of 40 db. Assuming a normal microphone level at the input of the preamp to be —60 dbm, the normal preamp output will be —2 dbm. Now working backwards, a line level output of +8 dbm will require the input to the line amplifier to be held at —32 dbm. Thus, it is necessary that the mixing pads provide a 30-db loss between each of the six preamps and the line amplifier. This is a very realistic figure for mixing six signals. As the preamp is capable of a +4-dbm output and the line amplifier is capable of a +18 dbm output, one need not worry about distortion. What about noise level? The preamps, in mind, have been rated 50 db below +4 dbm when operating at full gain. The gain has been reduced 12 db and, as the control is in the middle of the amplifier circuits, the noise level is also reduced 12 db which raises the S/N ratio to 62 db. The output, however, is 6 db below rated so the signal-to-noise ratio is now 56 db. The line amplifier, being considered, is rated 63 db below +8 dbm and as the operating control is at the input, no noise reduction is affected by having this control turned down. As the normal output is +8 dbm, the signal-to-noise ratio is 63 db. However, the input signal-to-noise ratio is only 56 db; therefore, the line amplifier does not introduce any noise into the system.

As the power amplifier has a gain of 50 db and a normal power output of +53 dbm, it is necessary to reduce its gain by 5 db for operation from a



Universal phono pickup replacement cartridge for 78 rpm applications. Available in two models; one is furnished with an externally mounted capacitor for low-voltage (2 or lower output) replacement (capacitor can be slipped off for high-voltage replacements) and the other comes without capacitor. (Models AU and A; Turner Co., 930 17th Street N.E., Cedar Rapids, Ia.)

+8 dbm line. Again, this control is at the input and does not affect the noise of the power amplifier which is rated 60 db below 53 dbm. Here again, the input signal with its 56 db S/N ratio is the controlling noise factor.

It should now be apparent that adjusting a system for optimum operation requires only a simple logical approach and a thorough knowledge of the amplifiers used.

Tube News

(*Continued from page 22*)

derating. However, when operated above 35°*C*, the plate area of the rectifier must be increased or the output power must be decreased, so that the sum of the internal forward and reverse losses will not raise the plate temperature above 75°*C*. Provided the rectifier is properly designed and operated at its intended ratings, the life expectancy can be said to be about 30,000 hours or perhaps about four years.

References

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Koch, D. G.; *Increasing Tube Reliability in Industrial Circuits,* Product Engineering; June, 1952.

Service Engineering

(*Continued from page 21*)

sufficient time for the capacitor to discharge, which turns on the speaker.

An *anti-jitter circuit* is used to prevent the receiver from being turned off and on rapidly, which might occur when the program material has just changed from music to speech or during pauses in the speech. Also a flip-flop circuit is used, instead of a time delay, because the delay would unnecessarily increase the time required to silence the radio when the memory capacitor is adequately charged.

The anti-jitter circuit controls the action of a filtered rectifier circuit which when turned on, develops the required negative output voltage.

The required positive and negative *dc* and heater voltages for the tubes are obtained from a built-in power supply. A transformer of the isolation type (not an autotransformer) is used, so that the device may be attached to transformerless (*ac-dc*) chassis.

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J330P Portable 30 watt public address system: J330 Amplifier, microphone, two 12" speakers mounted in snap-together carrying case.

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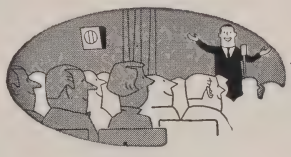

Cash in on permanent PA installations, too—we'll do all the work!

Bogen engineers are ready to help you draw up plans and specifications for any type job—at a moment's notice...and the Bogen PA catalog can tell you at a glance which system goes where for the most installations. Also, don't overlook the profit possibilities in servicing existing PA and intercom installations in your community.

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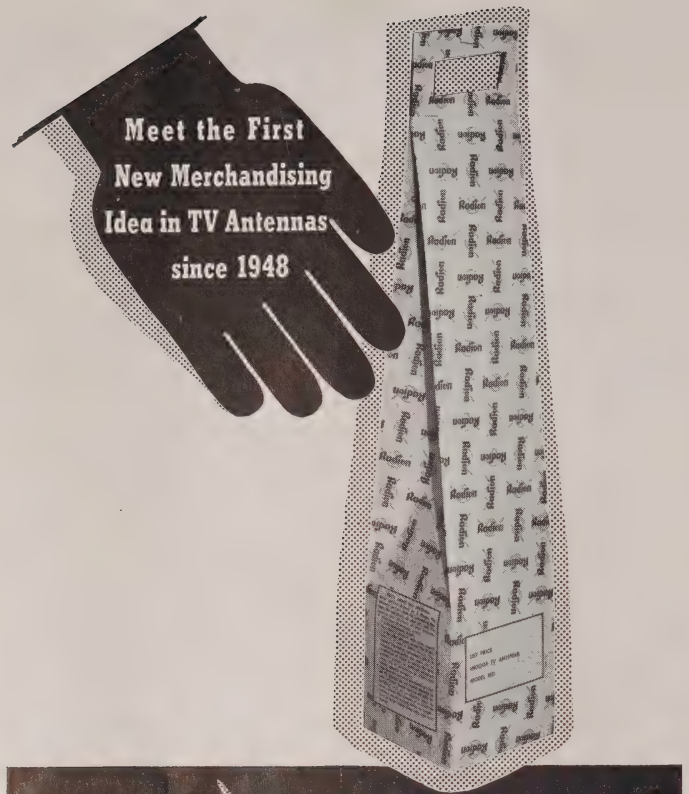


Easy pick up of impulse sales, extra profits

Average Inventory
Value $27.00

Sell only 12

QTA-3 Antennas a week

make $44.40 profit

(Same floor space as 1 TV set)

Make the 3 sq. ft. under a Radion Antenna carton the most profitable space in your whole store. Contact your jobber or write direct for Radion Profit Plan.

Radion THE RADION CORPORATION
Dept. S, 1130 W. Wisconsin Ave., Chicago 14

Color TV Tubes

(*Continued from page* 15)

emits electrons from both sides. The electrons pass from the cathode to either of the two plates in the form of a planar beam or *sheet*. The tube may be thought of as a voltage-controlled switch. By applying approximately $+20$ v to one deflector and -20 v to the other deflector, the beam current will be directed almost entirely to one plate. By reversing the polarity of the voltages on both deflectors, the beam current will be switched almost entirely to the other plate. Thus, an *ac* voltage between deflectors of about 40 v peak-to-peak would alternately switch all of the beam current from one plate to the other. Zero voltage between deflectors causes the beam current to divide between the two plates. The control grid enables the intensity of the beam to be varied, the focus electrode tends to converge the electrons into the required beam, and the accelerator accelerates the beam toward the plates.

Typical 6AR8 Circuits

In a typical circuit with two 6AR8s as I and Q synchronous detectors, the 3.58-mc signal is applied in push-pull to the deflectors of the tube. This deflects the beam from one plate to the other at the frequency of the color subcarrier. The chrominance signal is applied to the control grid of the tubes. Because the I signal is 90° out of phase with the Q signal, it will be going through zero, when the Q signal is at its maximum and will have negligible effect upon the Q output. A coupling capacitor (C_c in Fig. 4 on page 15) provides the necessary 90° phase shift in the 3.58-mc signal to enable the second 6AR8 tube to detect only the I signal. A significant advantage in using the 6AR8 is that output signals of both polarities are available for matrixing; this eliminates the need for separate phase-inversion stages preceding the matrixing system. A variable resistor in the cathode of one 6AR8 enables the outputs of the two tubes to be balanced.

6BJ7 Properties

The 6BJ7 is a miniature triple diode intended primarily for use as a *dc* restorer in each of the three signal channels of color television receivers. For circuit flexibility, each diode incorporates a separate cathode. The electrical characteristics of each section of the tube are similar to those of each section of the 6AL5.

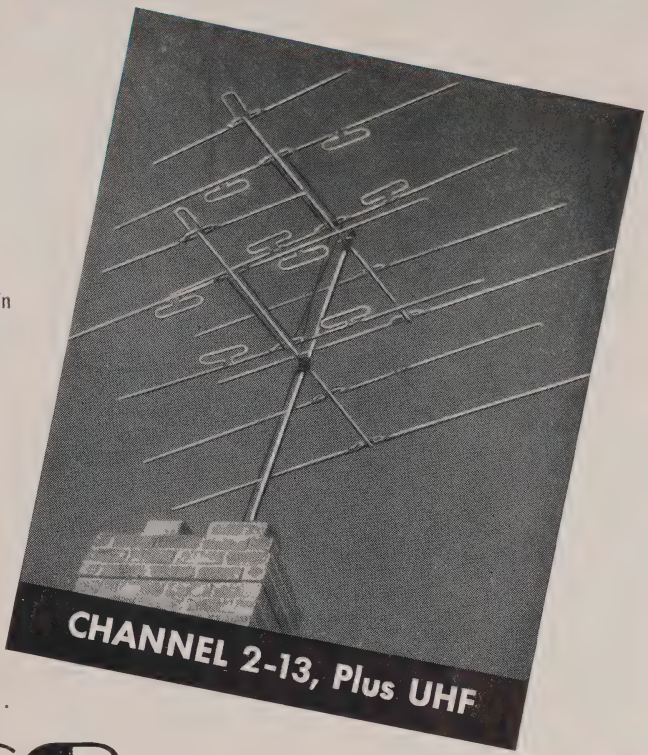
Next Month: Color-Tube Performance Control

NATION WIDE!

THE FIRST CHOICE OF SERVICEMEN

Here's the antenna beyond all comparisons — the antenna that gives you exactly what you want in packaging, ease of assembly, appearance, and above all, customer satisfaction through outstanding performance.

The Taco Trapper is the only high-gain, broad band antenna that retains the appearance, mechanical balance, and low wind resistance of the accepted medium-gain, streamlined yagi design.



Cat. No. 1880 Taco Trapper . . $18.20 ea.
Cat. No. 1882 Stacking Kit . . 1.50 ea.
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(For Increased Low Band Gain)
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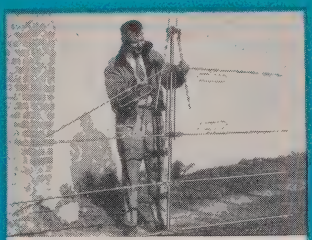
COMPLETE DETAILS FROM YOUR DISTRIBUTOR . . .

the TACO TRAPPER . . .

Registered Trade Mark — Patent Applied For

•Packed two antennas per carton . . . No king-size cartons — fits in average auto!

Completely factory-assembled — no loose parts!



Opens as easily as an umbrella. Elements automatically lock in position!

Exclusive Taco design permanently locks elements — WITHOUT USE OF TOOLS.

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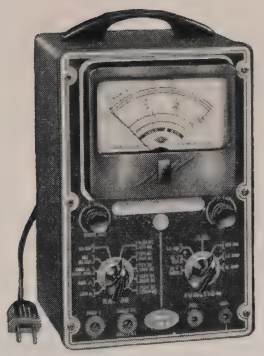


Superior's new Model 670-A SUPER METER

A COMBINATION VOLT-OHM MILLIAMMETER PLUS CAPACITY REACTANCE INDUCTANCE AND DECIBEL MEASUREMENTS

SPECIFICATIONS:

D.C. Volts: 0 to 7.5/15/75/150/750/1,500/7,500 Volts
A.C. Volts: 0 to 15/30/150/300/1,500/3,000 Volts
Output Volts: 0 to 15/30/150/300/1,500/3,000 Volts
D.C. Current: 0 to 1.5/15/150 Ma. 0 to 1.5/15 Amperes
Resistance: 0 to 1,000/100,000 Ohms 0 to 10 Megohms
Capacity: .001 to 1 Mfd. 1 to 50 Mfd. (Good-Bad scale for checking quality of electrolytic condensers.)
Reactance: 50 to 2,500 Ohms, 2,500 Ohms to 2.5 Megohms
Inductance: .15 to 7 Henries 7 to 7,000 Henries
Decibels: −6 to +18 +14 to +38 +34 to +58

ADDED FEATURE:

Built-in ISOLATION TRANSFORMER reduces possibility of burning out meter through misuse.

The Model 670-A comes housed in a rugged crackle-finished steel cabinet complete with test leads and operating instructions.

$28.40 NET

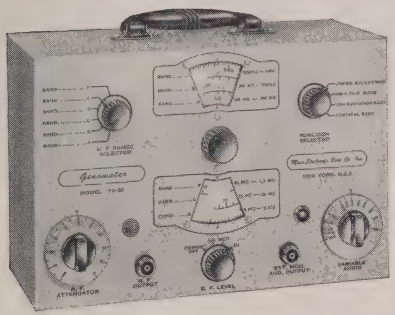
Superior's new Model TV-11 TUBE TESTER

★ Tests all tubes including 4, 5, 6, 7, Octal, Lock-in, Peanut, Bantam, Hearing Aid, Thyratron, Miniatures, Sub-Miniatures, Novals, Sub-minars, Proximity fuse types, etc.
★ Uses the new self-cleaning Lever Action Switches for individual element testing. Because *all elements are numbered according to pin-number in the RMA base numbering system,* the user can instantly identify which element is under test. Tubes having tapped filaments and tubes with filaments terminating in more than one pin are truly tested with the Model TV-11 as any of the pins may be placed in the neutral position when necessary.
★ The Model TV-11 does not use any combination type sockets. Instead individual sockets are used for each type of tube. Thus *it is impossible to damage a tube by inserting it in the wrong socket.*
★ Free-moving built-in roll chart provides complete data for all tubes.
★ Newly designed Line Voltage Control compensates for variation of any Line Voltage between 105 Volts and 130 Volts.
★ NOISE TEST: Phono-jack on front panel for plugging in either phones or external amplifier will detect microphonic tubes or noise due to faulty elements and loose internal connections.

EXTRA SERVICE—The Model TV-11 may be used as an extremely sensitive Condenser Leakage Checker. A relaxation type oscillator incorporated in this model will detect leakages even when the frequency is one per minute.

The Model TV-11 operates on 105-130 Volt 60 Cycles A.C. Comes housed in a beautiful hand-rubbed oak cabinet complete with portable cover. .....

$47.50 NET



THE NEW MODEL TV-50 GENOMETER

A versatile all-inclusive GENERATOR which provides ALL the outputs for servicing:

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7 Signal Generators in One!

- R. F. Signal Generator for A.M.
- R. F. Signal Generator for F.M.
- Audio Frequency Generator
- Bar Generator
- Cross Hatch Generator
- Color Dot Pattern Generator
- Marker Generator

R. F. SIGNAL GENERATOR: The Model TV-50 Genometer provides **complete** coverage for A.M. and F.M. alignment. Generates Radio Frequencies from 100 Kilocycles to 60 Megacycles on fundamentals and from 60 Megacycles to 180 Megacycles on powerful harmonics.

VARIABLE AUDIO FREQUENCY GENERATOR: In addition to a fixed 400 cycle sine-wave audio, the Model TV-50 Genometer provides a variable 300 cycle to 20,000 cycle peaked wave audio signal.

BAR GENERATOR: The Model TV-50 projects an actual Bar Pattern on any TV Receiver Screen. Pattern will consist of 4 to 16 horizontal bars or 7 to 20 vertical bars.

CROSS HATCH GENERATOR: The Model TV-50 Genometer will project a cross-hatch pattern on any TV picture tube. The pattern will consist of non-shifting, horizontal and vertical lines interlaced to provide a stable cross-hatch effect.

DOT PATTERN GENERATOR (For Color TV): Although you will be able to use most of your regular standard equipment for servicing Color TV, the one addition which is a "must" is a Dot Pattern Generator. The Dot Pattern projected on any color TV Receiver tube by the Model TV-50 will enable you to adjust for proper color convergence.

MARKER GENERATOR: The Model TV-50 includes all the most frequently needed marker points. The following markers are provided: 189 Kc., 262.5 Kc., 456 Kc., 600 Kc., 1000 Kc., 1400 Kc., 1600 Kc., 2000 Kc., 2500 Kc., 3579 Kc., 4.5 Mc., 5 Mc., 10.7 Mc. (3579 Kc. is the color burst frequency.)

The Model TV-50 comes absolutely complete with shielded leads and operating instructions.

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NO MONEY WITH ORDER — NO C.O.D.

Try any of the above instruments for 10 days before you buy. If completely satisfied *then* send down payment and pay balance as indicated on coupon. **No Interest or Finance Charges Added!** If not completely satisfied return unit to us, no explanation necessary.

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Dept. D-85, 3849 Tenth Ave., New York 34, N. Y.

Please send me the units checked. I agree to pay down payment within 10 days and to pay the monthly balance as shown. It is understood there will be no finance, interest or any other charges, provided I send my monthly payments when due. It is further understood that should I fail to make payment when due, the full unpaid balance shall become immediately due and payable.

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City.....*Zone*.....*State*.....

☐ Model 670-A . . . Total Price $28.40 $7.40 within ten days. Balance $3.50 monthly for 6 months.

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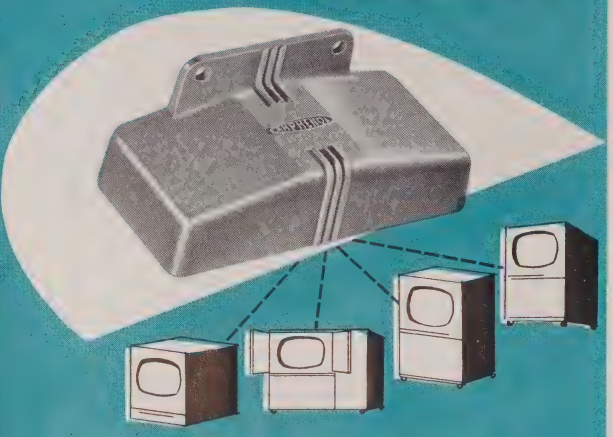
☐ Model TV-50 . . . Total Price $47.50 $11.50 within 10 days. Balance $6.00 monthly for 6 months.

VHF, UHF, VHF / UHF, FM...

AMPHENOL

new TELE-COUPLER



up to 4 TV SETS – only 1 antenna!

TV or FM set owners can now operate up to 4 sets with a single antenna!—with the easy installation of an AMPHENOL Tele-Coupler. This ingeniously designed accessory will work equally well for VHF, UHF and FM, or any of these combined provides good picture/sound reception between each set without annoying interference.

The heart of the Tele-Coupler is a specially designed bifilar network which combines a high isolation factor for VHF, UHF and FM sets with a low insertion loss factor. The network is weather-protected both at the top and at the sides by a sturdy and attractive grey plastic case—protection which makes the outdoor installation of the Tele-Coupler completely dependable. The Tele-Coupler is available in four models: two and four set couplers, with and without grounding lugs.

PRICES:

114-088 Two Set	$3.75
114-089 Same, with grounding lug	4.75
114-090 Four Set	5.75
114-091 Same, with grounding lug	6.75

AMPHENOL

AMERICAN PHENOLIC CORPORATION *chicago 50, illinois*
In Canada: AMPHENOL CANADA LTD., *Toronto*

PERSONNEL

RAYMOND BUHRMAN has been appointed sales coordinator of the Alliance Manufacturing Co., Alliance, Ohio. He will coordinate sales and advertising.

* * *

IRVING P. WOLFE, formerly head of Chief Electronics, Inc., has been named eastern sales manager for Walsco Electronics Corp., Los Angeles, Calif. . . . ROBERT J. MUELLER is now vice president in charge of sales.

Irving P. Wolfe

Robert J. Mueller

L. Arthur Hoyt

L. ARTHUR HOYT has become ad manager of the cathode-ray tube division of Allen B. DuMont Labs, Inc., Clifton, N. J. Hoyt, with DuMont since '52, has been editor of DuMont's *Oscillographer*.

* * *

JACK POWERS, formerly a rep, has been appointed sales manager of the Edwin I. Guthman and Co., Inc., Chicago, Ill.

* * *

STANLEY KRAMER has been appointed assistant sales manager of the semi-conductor division of Radio Receptor Co., Inc., New York City.

Stanley Kramer

Lee F. Holleran

Frank M. Holliday

LEE F. HOLLERAN has been named general marketing manager of RCA's tube division. . . . CLIFFORD M. RIGSBEE has been appointed administrator, consumer product analysis, product planning, RCA. . . . MARTIN F. BENNETT is now director of regional operations.

FRANK M. HOLLIDAY has been appointed field lecturer of the sales engineering department of the Raytheon Manufacturing Co., TV and radio operations. He will conduct a nationwide series of forums on TV dealer and servicing operations.

* * *

MILTON SCHINDLER is now administrative assistant to Ben Snyder, president of the Snyder Manufacturing Co., Inc., Philadelphia, Pa.

Milton Schindler

Horace L. White

James L. Brown

JAMES L. BROWN has been named regional manager, midwest sales, for CBS-Hytron, Danvers, Mass.

HORACE L. WHITE is now industrial sales manager of the Jensen Manufacturing Co., Chicago, Ill.

* * *

JAMES F. WHITE, formerly with CBS-Columbia, has been appointed general sales manager of Crescent Industries, Inc., Chicago, Ill.

FIRST, during 1954, in Number of Advertisers and Advertising Volume

24th year of publication

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2 new additions

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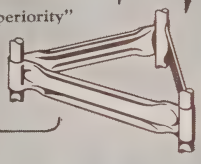

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Curbing TVI

(*Continued from page 17*)

nel oscillator coils are adjusted first, they would have to be readjusted after the higher channel coils were. This obtains because of the series-inductance tuning characteristics of *rf* units. In shifting the tuning of the local oscillator, various methods can be employed.

The grid-dip-meter is very effective. Placing this instrument near the local oscillator coil of the channel to which the receiver is tuned will indicate the present frequency of this coil. This oscillating frequency should conform with the manufacturer's specifications for the particular receiver. Changing the grid-dip-meter tuning by Δ_{if}, lower in frequency, the oscillator coil can be adjusted for peak indication on the grid-dip-meter. This will represent the new or shifted oscillating frequency for this coil, and the process should be repeated for each channel.

Another satisfactory procedure is with a *rf* sweep generator. This equipment will produce a sweeping signal for each channel, and the signal can be fed to the receiver through the antenna connection. A 'scope connected at the video detector load resistor R_1 (Fig. 1; p. 17) will again offer visual observation of the overall *if* response. In this instance, it will be the actual *if* response, resulting from the local oscillator heterodyning with the sweeping *rf* signal. Each channel oscillator coil can then be adjusted, so that the response curve on the 'scope will be that of Fig. 2 (p. 17); *solid line*. An *rf* marker tuned to the channel carrier points will then produce *if* carrier points in the respective proper positions on the shifted response curve; solid line, Fig. 2; p. 17.

The third procedure involves alignment of the local oscillator by using the signal radiated from the station or stations in the locality. This is somewhat limited in its application, because only the local oscillator for the channel in a certain area can be adjusted. The antenna should be connected to the receiver with the shifted *if*. If the station signal is strong in the area, the stations' signals will be found on the next lower channel. This will be so because the frequency of the local oscillator of the next lower channel will be heterodyning with the *rf* gain the off-channel is supplying to the station signal, producing an output equivalent to that of the shifted *if* response. The coil of the local oscillator can be adjusted for best sound and picture when the station selector is on the respective channel. If the receiver remains in this locality, or if no additional channels appear, this solution will hold.

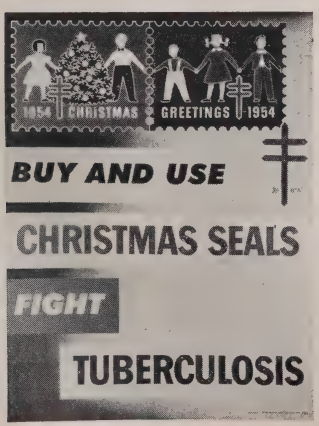
A fourth approach that can be used might be called *the two-carrier method*. This is quite an accurate procedure since it effectively allows a peak-frequency adjustment of the oscillator coil, like the grid-dip-meter method. It involves supplying the two channel carriers (picture carrier and sound carrier of each channel) and feeding them into the receiver at the *rf* or antenna input. A *vtvm* placed across the limiter-grid resistor will give a peak indication when the oscillator is adjusted for the correct frequency to produce the new *if*. Both picture and sound carriers are required because in an intercarrier-type receiver, the sound *if* (peak limiter grid voltage) is developed from the heterodyning effect taking place in the video detector to produce the 4.5-mc resultant frequency. Some *rf* signal generators are equipped with a 4.5-mc crystal which *beats* with its output to produce frequency harmonic points at every 4.5 mc. This feature eliminates the need for two signal generators. When this type generator is tuned to produce a picture carrier output frequency of a channel, the crystal will heterodyne with this, and a sound

carrier frequency 4.5 mc away will result. Adjustment of the local oscillator coil to the two channel carriers will produce peak indication on the *vtvm;* this procedure should be followed for each successive channel.

The local oscillator frequency of the receiver under study, for channel *13,* is 257 mc to produce an *if* picture carrier of 45.75 mc. This then will have to be shifted by Δ_{tf} down, or 3.75 mc down in frequency. This will produce the frequency 253.25 mc, and result in the *if* picture carrier at 42 mc and the sound carrier at 37.50 mc. Next would be the channel-*12* oscillator adjustment and so on down to channel *2.* If the grid-dip-meter method is used, meter should be tuned to 253.25 mc, channel-*13* oscillator coil squeezed and turn loops made larger until maximum indication is observed. Other adjustments can follow.

To summarize, there are two types of radiated signals that can cause *TVI.* First we have those signals that are harmonics of the fundamental carrier which fall in the *rf* pass band or within the channel tuning of the receiver. In the second classification are those fundamental radiated carrier signals that are in the same frequency band as the *if* pass band of the receiver.

The problem often can be resolved by keeping both types of signals from reaching the *if* stages by means of external attenuation devices as mentioned earlier. But, there are cases where *TVI* signals are so strong, that attenuation devices will not keep the signals from reaching the *if* amplifier. Then, it becomes necessary to shift the tuning of the *if* beyond the interference point and this can be done most effectively by realigning these stages so that the interference will fall in the null of the adjacent channel trap. This shift has been called Δ_{tf}, since it has to be determined from the frequency of *TVI* and manufacturer's specified frequency of adjacent channel trap.



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Heater-Filament Lines

(*Continued from page* 13)

plied by the last few volts of the high-voltage supply, through suitable dropping resistors. This is possible because the total current drawn by the tubes is only 50 *ma.* Dropping resistors are rated around 2 watts, and run 2,000 ohms for a 9-*v* string, and about 2,100 for a 7.5-*v* string. A 7.5-*v* string would use three 1.4-*v* tubes and a 3-*v* power tube; 1R5, 1T4, 1U5 and 3Q4, for instance, or 1A7, 1N5, 1H5 and 3Q5, in the octal series. A 9-*v* string would use one more 1.4-*v* tube, usually one more 1T4 or 1N5, as an *rf* amplifier. Although the rated voltage for these tubes is stated as 1.4 *v* (and they are usually referred to as *one-and-a-half-volt* tubes) the heaters are usually run at 1.25 to 1.3 *v,* with the 3-*v* tubes run at 2.5 *v.* This is well above the cutoff voltage of 1.1, and provides a bit of leeway for line surges.

Naturally, the delicate filaments of these tubes are very sensitive to both low and high voltages on their filaments. Too-high voltages will result in paralyzing the tubes, and too-low voltage will cause the output to suffer greatly. Oscillator types in particular, such as 1R5 and 1A7, are very critical as to heater voltages. They drop out of oscillation at around 1.1 *v.* This can be checked by measuring the filament voltage, directly at the socket terminals. If it is over 1.1 *v,* one should try a new tube. If voltage is 1.1 *v* or less, the rectifier and power-supply should be checked carefully.

Some sets use tube rectifiers (35Z5, 50Y6, 117Z3 or 117Z6) and some use selenium rectifiers. The input voltage to the filter should run well over 125 *v dc,* if the set is to function properly. With 115 *v ac* input to the set, all voltages should be well within the tolerances. If the filter input voltage is down to around 100 *v* trouble may be expected.

[To Be Continued]

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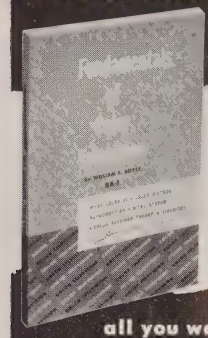

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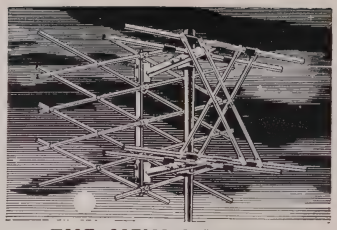

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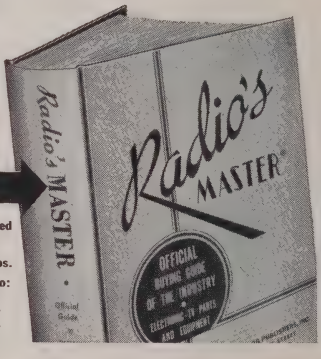
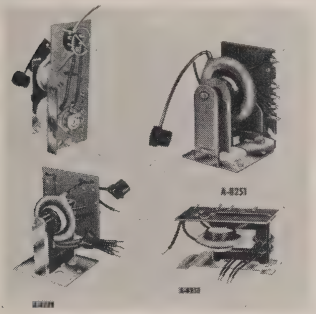


TV Parts... Accessories

CHICAGO STANCOR REPLACEMENT FLYBACKS

Four exact replacement flyback transformers, for Crosley, Hallicrafters, and DuMont TV receivers, have been announced by the Chicago Standard Transformer Corp., Addison and Elston Aves., Chicago 18, Ill.

Flyback replacement *A-8248* for Crosley and Hallicrafters models and chassis is listed with applications in bulletin *497*. Bulletin *498* lists flybacks *A-8249*, *A-8250* and *A-8251* with their applications for DuMont models and chassis.



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Six horizontal output transformers, *X107 through X112*, for exact replacements of Airline, Firestone, Coronado, Mitchell, Sentinel, Sparton, Truetone and Sonora TV chassis, are now available from Ram Electronic Sales Co., Irvington, N. Y.

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ANCHOR LINE ADJUSTER

A line adjuster, *LA 300*, designed to restore TV picture size or picture brightness when low line voltage has caused image to shrink or dim, has been introduced by Anchor Wire Products, 2712 W. Montrose Ave., Chicago 18, Ill.

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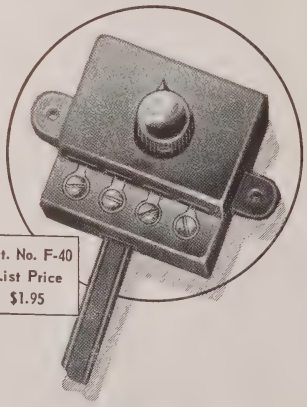

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Rep Talk

BOTH the Buckeye and Chicagoland chapters of The Reps have added new members; there are now 670 members in the national organization. *Mrs. Julia Baier,* 12429 Cedar Rd., Cleveland, O. and *Ed C. Lips,* 3302 Hazelhurst Rd., Pittsburgh, Pa. became senior members of the Buckeye chapter. Associates include: *David H. Baier, L. P. Clark* and *Robert K. Deunk,* all members of the Arthur H. Baier Co.; *Thomas O. Miles,* Walter J. Brauer Associates; *Frank P. Yarussi,* James Podolny Co., and *William G. Blocki,* West Richfield, Ohio. Senior Chicagoland members include: *Thomas B. Hunter,* 4441 W. Irving Park Rd., Chicago, Ill., and *Sam J. Mulay,* 4308 W. Armitage Ave., Chicago. Associates are: *Thomas B. Hunter,* III; *Walter Sparf; Leo M. Rusz,* and *Maurice F. Dunne, Jr.* . . . *Ben Eder, Max Moore* and *Jerry Saltman* have joined Perlmuth-Colman and Associates, 2419 S. Grand Ave., Los Angeles 7, Calif. . . . *James F. Gerrity,* 74 Gatling Pl., Brooklyn, N. Y., is now a rep for the Crestwood Recorder Division, Daystrom Electric Corp., in New Jersey north of Trenton, except Phillipsburg, New York City, Long Island and Westchester County, N. Y. . . . *Bob Miller Sales Co.,* 805 Eldorado, Clearwater Beach, Fla. (Florida), and *Bittan-Boenecke Co.,* 210 N. Sixth St., Camden, N. J. (eastern Pennsylvania, south to Washington and Maryland) have been appointed reps for the General Instrument and Appliance Corp. . . . *John T. Butters,* 307 Electric Building, Wilmington, N. C., is now Seco Manufacturing Co. rep in Alabama, Mississippi, North and South Carolina, Florida, Georgia and Tennessee. . . . *Frank Siegmund,* P.O. Box 162, Phoenix, Ariz. (Arizona and New Mexico), and *E. W. Rowland Associates,* 110 Washington St., N.Y.C. (New England), have been named reps for the Winegard Co. . . . *Oscar Kraut,* formerly sales manager of Cabinart, has joined the staff of Blair-Steinberg Co. and will cover the middle eastern states. . . . Parker Metal Goods Co. has appointed the following reps: *Burton Homsher* (Indiana); *R. W. Farris Co.* (Iowa, Nebraska, Kansas and Missouri); *A. B. M. Sales* (Michigan); *Jack Brown* (New York State); *William Connors* (Colorado, Utah, New Mexico and Wyoming, Scotts Bluff, Nebraska, El Paso, Texas, Idaho and Montana); *Harris Pound* (Canada); *C. L. Pugh* (Kentucky, W. Virginia, Ohio and western Pennsylvania); *J. Earl Smith* (Arkansas, Oklahoma, Louisiana and Texas); *Maitland K. Smith* (North and South Carolina, Georgia, Florida, Tennessee, Alabama and Mississippi); and *Dayton L. Warner Co.* (Illinois and Wisconsin). . . . *Samuel N. Stroum Co.,* 1612 Broadway, Seattle, Wash. is now rep for the Radell Division, I.D.E.A., Inc., in Washington and Oregon. . . . *Joseph Sprung,* 254 W. 35th St., New York City, has been appointed rep for Crescent Industries speakers, in the greater New York area. . . . *D. Dolin Sales,* 1200 N. Ashland Ave., Chicago, Ill. (Chicago and downstate Illinois), and *Lowry and Dietrich Co.,* 1404 Swantek St., Pittsburgh, Pa. (western Pennsylvania and West Virginia), are now reps for the Elco Corp.

NEWS

E-Z WAY TOWERS EXPANDS

E-Z Way Towers, Inc., has moved to new quarters at 5901 E. Broadway, Tampa, Fla.

New location provides 50,000 square feet of space including loading facilities. *C. J. Jax* is president of the company.

* * *

IMPERIAL OPENS CALIF. BRANCH

Opening of a factory and warehouse at 15204 Oxnard St., Van Nuys, Calif., has been announced by the Imperial Radar and Wire Corp.

Coast branch will feature a line of aluminum, steel, and copperweld guy wire; ground wire; open lead wire; aluminum, copper and copper-capped ground rods; and ground mast clamps and ground rod clamps.

* * *

SYLVANIA PIX TUBE PLANT NOW ON PACIFIC COAST

A 51,000 square-foot building, for the manufacture of TV picture tubes, was opened recently by Sylvania in Fullerton, Calif. Plant is on East Orangethorpe Avenue.

At the plant's dedication ceremonies, *H. Ward Zimmer*, Sylvania prexy, was the principal speaker.

* * *

CLAROSTAT ACQUIRES CARBON-RESISTOR CO.

Purchase of Campbell Industries, Inc., Chattanooga, Tenn., manufacturers of specialized carbon-resistance products has been announced by Clarostat Manufacturing Co., Inc., Dover, N. H.

George S. Campbell will continue active management of company in the capacity of general manager.

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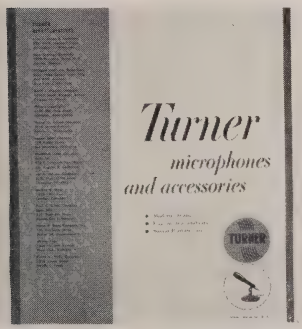

General catalog covering microphones, phono pickup cartridges, microphone interiors and microphone accessories. Features detailed information on dynamic, carbon, crystal and ceramic replacement cartridges for Turner microphones; 40 models of various types and impedances are described. (General catalog No. 961-A; Turner Co., 930 17th Street, N.E., Cedar Rapids, Ia.)

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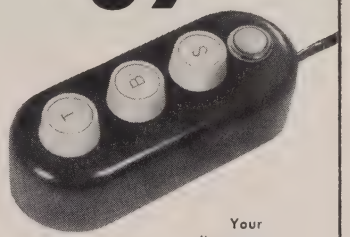

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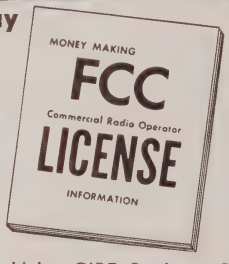

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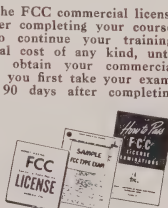

Tools . Parts

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A selenium rectifier that features edge-mounted plates (said to provide full air circulation between plates), light constant contact pressure (claimed to eliminate center hot spots), small overall size and simplified mounting, has been developed by the Pyramid Electric Co., 1445 Hudson Blvd., North Bergen, N. J.

Rectifier, available in all current ratings, can be used as replacements.

* * *

TRU-OHM RESISTORS

Replacement resistors, *Econohm,* rated at 5 and 10 watts, are now available from True-Ohm Products, 2800 Milwaukee Ave., Chicago 18, Ill.

Resistors are wound on ceramic cores; tinned copper leads are so attached, it is said, that the possibility of stresses being transmitted to the winding are eliminated.

* * *

OXFORD SHALLOW SPEAKERS

A series (*H*) of shallow *pm* speakers with Alnico *V* magnets, for use as replacement units in radio and TV chassis employing such speakers as original equipment, have been announced by Oxford Electric Corp., 3911 S. Michigan Ave., Chicago 15, Ill.

Voice coil impedance is 3.2 ohms. Sizes include: *H2A,* 2 17/32" square; *H3A,* 3 7/16" square; *H4A,* 4 3/32" square; *H5A,* 5" round; and *H46A,* 6 3/32" x 4 3/32" rectangular.

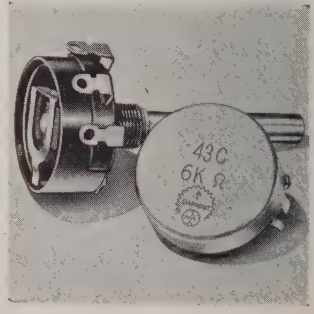
* * *

CLAROSTAT WIRE-WOUND CONTROL

A 1⅛" wire-wound control, *43C,* has been announced by Clarostat Manufacturing Co., Inc., Dover, N. H.

Features an improved wiper arm that contacts the edge rather than side of the resistance winding; this contact is said to allow higher resolution, more intricate tapers and closer tolerances in overall resistance and linearity. Terminals are directly fastened to winding. Collector and terminal are now in one piece, eliminating rivets as mechanical fasteners and current conductors. Stop is integral with base instead of in the cover.

Available in standard ohmages from 1 to 50,000, with electrical tolerance of ± 5%, and independent linearity to ± 2%. Rated at 2 watts. Taps and various tapers available.



Instruments

C-D FLYBACK TRANSFORMER-YOKE CHECKER

A flyback transformer and yoke checker, *BF-80,* designed to detect short-circuit turns in windings by indicating inductance change, has been introduced by the Cornell-Dubilier Electric Corp., South Plainfield, N. J.

Instrument employs an oscillator circuit, a 6V6 and a microammeter (50 ua) with separate indicator scales for short tests, continuity tests, and yoke tests. Open circuited conditions also can be detected in transformers, coils and switches, or shorted elements in tubes.

C-D Flyback and Yoke Checker

* * *

HYCON 'SCOPE AND DIGITAL VM

A 'scope, *617,* delivering a 3" undistorted trace from edge to edge, has been announced by the Hycon Manufacturing Co., 2961 E. Colorado St., Pasadena 8, Calif.

Specifications include 4.5-mc bandpass (±1 db, vertical amplifier), high-deflection sensitivity (.01 *v/rms* per inch), internal calibrating voltages, and edge-lighted bezel.

A digital voltmeter, *615,* which replaces the deflecting needle and multiple scales found on conventional voltmeters with a revolving three-digit counter, similar in appearance to an automobile mileage indicator, is also available.

Sensitivity ranges for the voltmeter are from 1 *mv* to 1,000 *v* and from 1 kc to 10 mc.

* * *

PRECISION SIGNAL GENERATOR

A sine-square wave signal generator, *E-300,* providing sine and square wave signals for direct performance testing of *hi-fi* audio amps, TV audio amps, carrier current systems, and other wide-range devices, has been developed by the Precision Apparatus Co., Inc., 92-97 Horace Harding Blvd., Elmhurst, L. I., N. Y.

Instrument's specs include: variable-frequency sine-wave ranges . . . continuous coverage from 20 cycles to 200 kc (in three bands); four fixed, *hf* square waves . . . 50—100—250—500 kc steps. Tube complement includes 1-5879, 1-6CL6, 1-6J6, 2-6AU6, 1-6BL7, 1-6AH6 and 1-6X4.

An operating manual which describes basic techniques of sine-square testing, is obtainable at 25¢ per copy.

Just what the TV Doctor ordered...

℞ STANCOR EXACT REPLACEMENT FLYBACKS

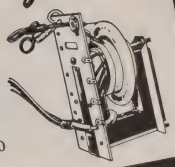
Whether the "patient" is a Crosley, a Muntz, an RCA, or any other brand, you can be sure of a prompt recovery when the prescription reads "STANCOR"

℞ Patient: Muntz

Stancor A-8242

New Exact Replacement Flyback for Muntz TO-0028 and TO-0029

List Price.....$9.00



℞ Patient: Crosley Super V, Hallicrafters

Stancor A-8241

New Exact Replacement Flyback for Crosley 157820 and Hallicrafters 550251

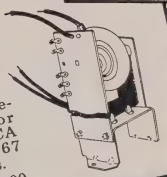
List Price.....$8.10

℞ Patient: RCA

Stancor A-8244

New Exact Replacement Flyback for RCA 78201 and RCA 78810. Used in 67 models and chassis.

List Price.....$10.00



FREE—HIGH FIDELITY, Ultra-Linear Amplifier Bulletin 479 describing performance and construction of the 24 watt Stancor-Williamson Amplifier, using Stancor Ultra-Linear Output Transformer A-8072 ($15.00 net). Available from your distributor.

CHICAGO STANDARD TRANSFORMER CORPORATION

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EXPORT SALES: Roburn Agencies, Inc. • 431 Greenwich Street • New York 13, N. Y.

Stancor transformers are listed in Photofact Folders, Counterfacts, Radio's Master, and File-O-Matic.

SUPERIOR PICTURE-TUBE TESTER AND V-O-M

A picture-tube tester, *TV-40,* that tests magnetically-deflected tubes, is now available from Superior Instruments Co., 2435 White Plains Rd., N. Y. 67, N. Y.

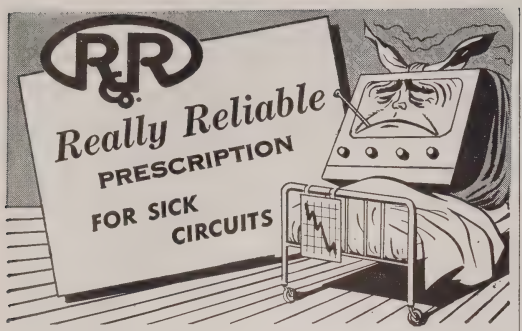
Features built-in power supply. Tests tubes from 7" to 30" by emission method, and also indicates open elements and interelement shorts and leakages of up to 5 megohms. Tube may be in the set, on the bench, or in the carton.

A pocket volt-ohm-milliammeter, *770-A,* built around an 850-microampere, D'Arsonval meter, is also available.

AUTHORIZED VARIABLE POWER SUPPLY

A portable variable power supply, *Multivolter 301,* providing a range of variable *dc* voltage from —135 through 0 to +135 *v,* as well as an *ac* range of 0 to 135 *v,* has been developed by the Authorized Manufacturers Service Co., 919 Wyckoff Ave., Brooklyn 27, N. Y.

Features 1 amp of 6.3 filament voltage at separate terminals. A neon indicator provides indication of current output, extinguishing when 20 *ma* is drawn.



Replace with RRco. rectifiers and diodes and insure long life and dependable performance ahead. Thousands of servicemen agree they're wonderful medicine!

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Video Detectors 1N60 and 1N64. U. H. F. Mixers 1N72 and 1N110. Other R.E.T.M.A. types available too.

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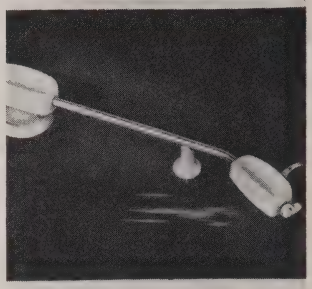
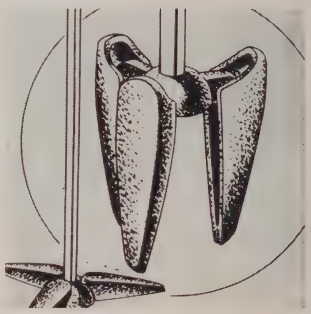
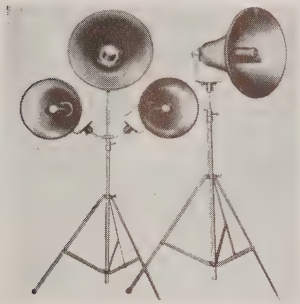


(Right)
Turnover pickup with adjustable stylus pressure which allows adjustment of from one to eight grams. Has double ball-bearing swivel. Mounting swivel and pickup head are molded of polopas plastic; **arm is of chromium plated tubing. Supplied with two sapphire styli.** (Ronette Acoustical Corp., 135 Front St., New York 5, N. Y.)



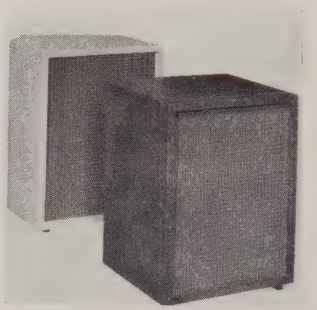
(Right)
Microphone floor stand (32½" collapsed) with chrome-plated 2-section telescopic staffs which extend to 61½". Has a channeled-surface sure-grip lock. **Base, open, is 16" in diameter and collapses to 6".** (MS-2; Snyder Manufacturing Co., Philadelphia 40, Pa.)



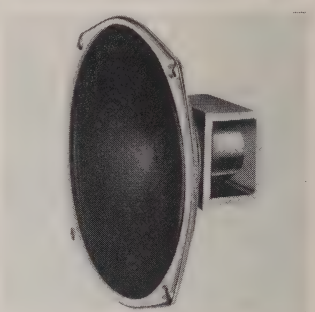
(Left)
Loudspeaker support stand designed to accommodate U-brackets of all makes and types of loudspeaker projectors. Top bracket adaptor is said to permit attachment or removal of a projector without need of unscrewing top adaptor or using tools. Cadmium-plated steel, rubber-tipped folding legs automatically level on uneven ground or turf. Has double lock **vertical adjustment to provide against accidental release. Height extension of 5' to 10'.** (Model SS-2; Atlas Sound Corp., 1451 39th Street, Brooklyn 18, N. Y.)

(Right)
Device designed to tell whether stylus pressure is correct. (Micro-Poise; Audak Co., 500 Fifth Ave., N. Y. 36, N. Y.)

Audio analyzer said to function as three instruments in one; ac vtvm, wattmeter, and intermodulation distortion analyzer. Features built-in low and high-frequency oscillators. (Model AA-1 (kit); Heath Company, Benton Harbor, Mich.)



Small size console speaker cabinets designed and licensed to use the Jensen Duette principle with tweeter and woofer. (Models AD-1 and 2; Argos Products Co., 4753 N. Broadway, Chicago 40, Ill.)



Eight-inch extended range speaker with 6.8-ounce Alnico V magnet, a power rating of 15 watts and a response up to 12,000 cps. It is equipped with an aluminum voice coil. (Model 850; G.E.)

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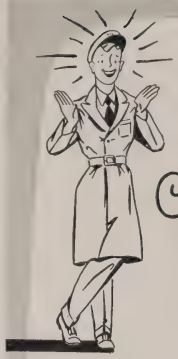

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Net Price.....(Less Kine).....$189.50

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Model 150

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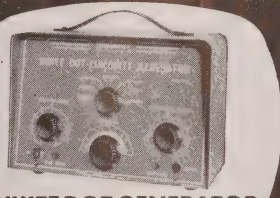
APPLICATIONS

• MASTER PHASE CONTROL test and alignment • CHROMA DEMODULATOR test and alignment (either I/Q or R-Y/B-Y) • QUADRATURE TRANSFORMER test and alignment • MATRIX CIRCUIT test and alignment • BURST AMPLIFIER test and alignment • PHASE DETECTOR CIRCUIT alignment for reference oscillator • REACTANCE CONTROL and REFERENCE OSCILLATOR adjustment • 3.58 MC TRAP alignment • TROUBLESHOOTING and PHASE ALIGNMENT in the home by picture patterns.



WHITE DOT GENERATOR

Model 160

THE WHITE DOT GENERATOR ENABLES COMPLETE ALIGNMENT OF ALL COLOR CONVERGENCE CIRCUITS PLUS SWEEP CIRCUIT LINEARITY AND SIZE, AS WELL AS GENERAL TROUBLESHOOTING BY SIGNAL TRACING.

APPLICATIONS

• DYNAMIC CONVERGENCE—vertical and horizontal test and adjustment • DC CONVERGENCE—test and adjustment • DEFLECTION COIL—positioning for best convergence • BEAM MAGNETS—alignment for best convergence • DYNAMIC PHASE ADJUSTMENT—vertical and horizontal • FOCUS—test and adjustment of DC and dynamic focus • TROUBLESHOOTING of all circuits affecting convergence • LINEARITY—test and adjustment of horizontal and vertical sweep linearity.

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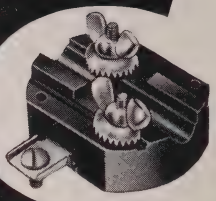

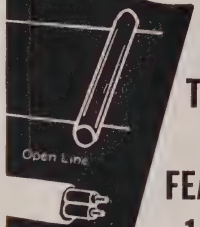

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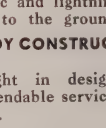

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DECEMBER, 1954

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JOTS AND FLASHES

As THE RESULT of a decision of audio equipment manufacturers who attended an industry-wide meeting during the recent New York Audio Fair, the Audio Activities Committee of the Sales Managers' Club (Eastern Division) have organized the *Institute of High Fidelity Manufacturers.* Charter has already been granted in New York State. To ensure equitable representation of all members in the organization, the Institute is to be governed by a board of directors comprising two members each of WCEMA, EP and EM, and Sales Managers' Club. While general promotion of the audio industry is the Institute's overall objective, immediate attention is being given to the matter of audio shows as the most pressing problem. Membership in the Institute, it was said, will not affect participation of individual manufacturers in distributor or privately-operated shows and affairs. This remains the prerogative of each firm and dependent, as always, upon its own policies. . . . Color-TV service meetings have been conducted by Bob Middleton of the *Simpson Electric Co.,* in the Los Angeles area and Arizona. Meetings were primarily of the demonstration type, in which a color-TV chassis and suitable test equipment were set up in the meeting hall, and correct methods of testing shown. . . . Construction of a plant building, comprizing 27,000 square feet, on the present site, has been announced by *Pyramid Electric Co.* Building will house executive and general offices, engineering and research labs, jobber division warehouse, and shipping department. . . . A record care kit, consisting of a 6-ounce can of anti-static spray cleaner for records; 2 packages of protective record sleeves made of polyethylene; a book on record care, and a small camel's hair brush for cleaning dust from needle tips, has been announced by *Walco Products, Inc.,* East Orange, N. J. . . . *Harry Fox* is now vice president in charge of sales of Star Expansion Bolt Co., Inc. . . . *Technical Appliance Corp.,* Sherburne, N. Y., manufacturer of Taco antennas, received a citation from General Motors during the recent 50-millionth US-built GM car event for their work in designing and supplying antennas to GM. . . . *William J. Marcus,* rep for Rider, recently celebrated his 20th year with the company. . . . Parker Metal Goods sales in the New York, New Jersey, eastern Pennsylvania, Washington, D. C., Maryland, Delaware and Virginia areas are now under the management of *Ben Selsby,* director of sales.

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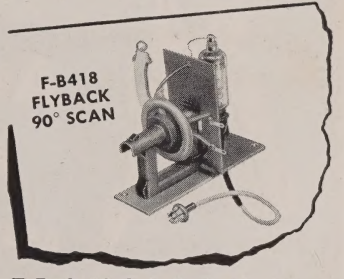

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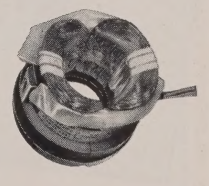

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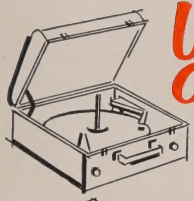
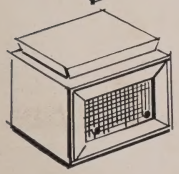
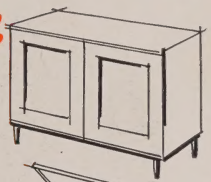
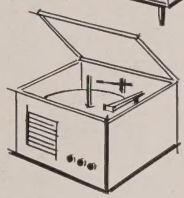




You, too, Mr. Serviceman:





—will enjoy the same satisfactory results from your Titone Pickup sales—an ever-widening market of quality-conscious, satisfied customers, who recognize that record reproduction can now be of unquestioned fidelity, yet simple, too.

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Hallicrafters Co.
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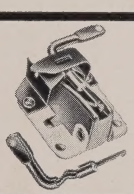
Motorola, Inc.
RCA Victor Corporation
Roland Radio Corporation
Sears Roebuck and Co.



Sentinel Radio Corp.
Steelman Phonograph & Radio Co.
Stromberg-Carlson Co.
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Symphonic Radio & Electric Corp.
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Warwick Manufacturing Co.
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Electronic Applications Division

SONOTONE CORPORATION

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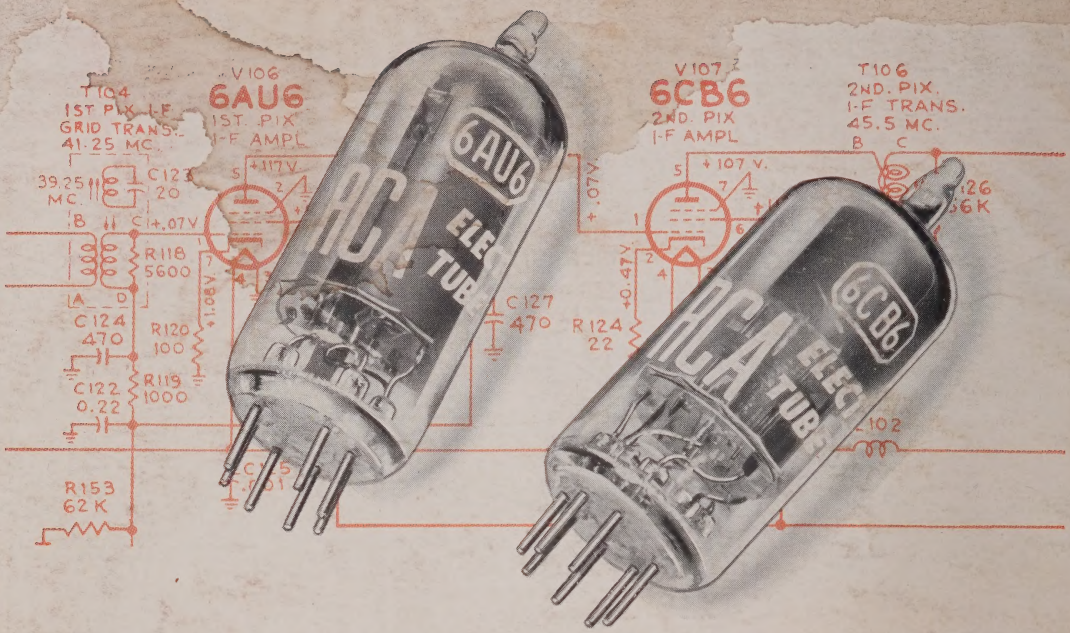

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